A Randomised, Controlled Trial of a Pharmaceutical Discharge Service.

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ABSTRACT

Objectives
Identification of drug related problems associated with the traditional system of hospital patient discharge. Development and evaluation of a pharmaceutical discharge service with respect to medication errors, patients’ and doctors’ views, and some associated costs and savings.

Methods
Development of the service was followed by a controlled trial. Seventy patients recruited from medical wards were randomly allocated to intervention (pharmaceutical discharge service with a pharmacist undertaking a supplementary drug history, reissuing appropriate medication, discharge counselling and preparing a typed discharge medicines letter for the GP), or control groups (traditional system of doctor-acquired drug history and doctor handwritten information on discharge medication to GP). Domiciliary visits were undertaken three weeks after discharge and the prevalence and severity of medication errors and the prevalence of intentional changes to medication by doctors was determined. Patients’ and general practitioners’ opinions’ of the provision of discharge medicines related information was sought and the costs and savings associated with the service were estimated.

Results
The pharmaceutical discharge service significantly reduced the number of patients experiencing medication errors from 55% to 11% (p=0.001, chi square test), but
did not alter the mean severity of medication errors (p=0.45, Mann-Whitney test),
or the prevalence of intentional changes to medication made by doctors after
patients were discharged, which occurred in 24% of intervention and 36% of
control patients. Fewer intervention group patients reported problems with
medication after discharge (p=0.001, chi square test), or having outstanding
questions regarding discharge medication (p=0.01, chi square test). Hospital
savings of £97.05 were realised by reissuing 80% of suitable medication.

Conclusion

A comprehensive pharmaceutical discharge service can reduce errors after
discharge. Medication changes occur in medical patients after discharge and may
be appropriate. The savings from reissuing drugs may not recoup the cost of
providing the service.
ACKNOWLEDGEMENTS.

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For my father Mohammed Dawoud and my son Ismael Dawoud.
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CHAPTER ONE. INTRODUCTION.

This thesis describes the development and evaluation of a clinical pharmacist led service of communication of medication related information between primary and secondary care in a U.K. hospital.

This chapter describes clinical pharmacy development in United Kingdom hospitals and studies evaluating a common clinical pharmacy service, that of prescription monitoring, are appraised. The primary/secondary healthcare interface is examined in detail to identify problems pertinent to pharmacists and relevant studies are critically discussed. Finally, the current climate within the health service in the U.K. provides a number of opportunities for pharmacists to develop their role in primary/secondary interface care and these are presented.


Clinical pharmacy services are provided by many U.K. NHS hospital pharmacy departments. This section summarises the development of clinical pharmacy in the U.K. over the last thirty years and describes some of the services currently provided. Increasingly, evidence of the effectiveness and efficiency of health care services is demanded, and the evidence supporting one clinical pharmacy activity will be examined to determine how and to what extent the service has been evaluated for effectiveness and efficiency.
1.1.1. Evolution Of Clinical Pharmacy In U.K. Hospitals.

Inadequate drug control systems were reported in the late 1960s to cause medication errors \(^1\) and the use of prescription forms that were kept with the patient were advocated \(^2-4\). It is generally believed that clinical pharmacy evolved when these serious deficiencies in medication prescribing and administration in U.K. hospitals were identified.

Formal recognition of clinical pharmacy occurred with the publication of the Nuffield Report in 1986, which made recommendations on the practice of clinical pharmacy \(^5\). It accepted that pharmacists had a valuable and unique role to play in the treatment of individual patients in hospital, without undermining the authority of the clinician responsible for the patient. Attendance on certain ward rounds and participation in new drug assessments were put forward as being potential tasks of which pharmacists were capable. Studies to determine the real need for services were recommended, as was a need for the appropriate bodies to produce a statement of the clinical services that should be provided in hospitals. In its conclusion, the Nuffield report recommended that clinical pharmacy should be practised in all hospitals. It saw the role of the clinical pharmacist as contributing to the choice of drug regimen, particularly where more than one condition is being treated, being in a position to supply physicians with evaluated information on pharmaceutical and therapeutic aspects of drug use as well as on the changing awareness of the toxicity profile of drugs, helping to decide on which dosage, form or formulation of an active principle should be used and the route of administration. Other roles included undertaking the responsibility for deciding the formulation of a medicine or treatment which the clinician prescribed, taking
responsibility for dosage calculations, and having a contribution to make in the interpretation of assays for drugs in body fluids.

The recommendations of the Nuffield enquiry were taken into account by the Department of Health circular HC(88)54 (6). Many regions in the U.K. formulated service specifications. The Royal Pharmaceutical Society of Great Britain statement of principles for hospital pharmacy includes that ‘pharmacists are professionally, ethically and legally responsible directly to the patient for the quality of care they provide. The pharmacist has a duty of care to the patient to ensure that the medicines they receive are safe, effective and represent an effective use of scarce NHS resources’ (7).

1.1.2. Evaluation of clinical pharmacy services

Clinical pharmacy has developed extensively in U.K. NHS hospitals. Although standards are set by health authorities, professional bodies and academic organisations on clinical pharmacy practice, the range of services provided may vary considerably between hospitals. Currently, activities undertaken by clinical pharmacists fall into two categories, namely ward based activities and policy level activities. The former includes those services that are offered to patients such as prescription monitoring and counselling, and to doctors, nurses and other health professionals in the form of formal and informal education and training. The latter includes formulary management, clinical trials co-ordination and the provision of financial and prescribing data to clinicians and managers.
A comprehensive survey of clinical pharmacy provided by U.K. NHS hospitals, published in 1994, sampled all U.K. districts and sent questionnaires to all hospital pharmacies that provided comprehensive services i.e. beyond drug supply. The authors reported that the most commonly provided service was drug therapy monitoring for acute and long-stay patients, provided by 97% and 93% of respondent hospital pharmacies. Other common services provided included clinical trials support (92%) and formulary management (89%). Pharmacists were also involved in specialist services such as therapeutic drug monitoring, nutrition and pain control. Since prescription monitoring has been reported as being the most frequently provided service, relevant studies will be appraised.

Many studies aiming to evaluate in-patient prescription monitoring have included some measurement of the process such as intervention monitoring, and a few have considered economic factors and acceptability of the service. Intervention recording is undertaken for staff education, medico-legal purposes, to analyse workload and justify staff levels and to measure the contribution of the pharmacist to patient care and cost savings.

Many studies investigating the number and nature of interventions made by clinical pharmacists have been reported. For inpatient drug charts, intervention rates of around 3% have been described. Where pharmacists attended ward rounds the number of interventions can be higher. Studies have reported that between 76% and 96% of interventions made by pharmacists are accepted by clinicians, and prescriptions altered in 77% to 81% of cases.
of cases as a result. Other surveys have determined time spent on prescription monitoring\textsuperscript{(21,22)}. Intervention rates and the amount of time pharmacists spend monitoring prescription do not give an indication of the clinical impact of the intervention. Evaluation of interventions can be undertaken in terms of determining the perceived benefit of the intervention or the perceived reduction in harm to the patient. Another method for describing the need for prescription monitoring focuses on prescription irregularities\textsuperscript{(23)}. The first U.K. study evaluating the effectiveness of prescription monitoring was undertaken in 1981\textsuperscript{(24)}. A ward pharmacy service was introduced at a single hospital and a sample of prescriptions before and after the service were reviewed for prescribing errors, which were defined as incompleteness, incorrectness or ambiguity of a prescription item. The authors reported a 46% reduction in the number of errors per patient and a 43% reduction in the number of errors per prescription. Errors were not graded for severity although the authors judged that errors were rarely dangerous but could cause confusion for nurses, and limitations of the study include lack of generaliseability and potential bias. Some studies, attempting to reduce bias, have objectively graded the significance of interventions using non-participant external examiners. In one study investigating the significance of interventions made by pharmacists and technicians, on the wards and in the dispensary of a single hospital over five months, a consultant physician’s opinion was sought on a random number of interventions, although all interventions were recorded by technicians and pharmacists. Of the 1585 interventions, 0.5% were considered to be life-saving, 3.7% to prevent toxicity, and 25% optimised patient care and
improved the standards of practice (19). Eadon evaluated the quality of interventions made at a cardiothoracic hospital (25). A six point system was used to determine the potential significance of interventions. All interventions were scored by a senior clinical pharmacist with three doctors scoring a random sample of interventions. There was no difference between pharmacist and doctor scores. Using this system, 53% of interventions were reported to lead to an improvement in patient care and 2% prevented major organ failure or significant adverse reaction. Interventions made by 35 pharmacists at six hospitals over twenty eight days were evaluated by an independent assessor (doctor) (11). Interventions were made on 2.9% of all prescriptions and 8% of interventions were judged to have potential for major harm to the patient. The authors did not investigate the costs of providing the service but noted that interventions took an average of 41 minutes per pharmacist per week. The largest study surveyed 210 pharmacists in 311 hospitals over 7 days (20). Of 2706 prescriptions that were questionable, pharmacists intervened on 2095 occasions and their advice was accepted in 96% of instances.

The costs of prescription monitoring and any cost savings have been determined infrequently. One single centre study (9), investigating the feasibility of a ward pharmacy service, surveyed prescriptions dispensed to surgical wards and included pharmacists’ time spent visiting wards and dispensing and nurses time. They reported a reduction in the time taken to dispense items and in nursing time visiting pharmacy, but total pharmacy costs rose. However, the researchers did not determine whether the service was economically feasible. One study, utilising a computer database of interventions, found that approximately 62% of
interventions were associated with potential cost avoidance \(^{(10)}\), where costs avoidance included reduction in drug costs, savings in drug therapy monitoring, savings attributable to complications associated with drug therapy, and savings relative to a reduction in length of stay, but did not provide financial values. However, interventions were found to rarely save money when based on drug costs alone \(^{(11)}\).

Retrospective prescription monitoring may be regarded as a policing role and it is important that doctors and nurses do not perceive pharmacists negatively as a result. A study into junior doctors acceptance of clinical pharmacists found that all doctors questioned rated prescription monitoring by pharmacists as being quite or very useful \(^{(14)}\). Doctors also seemed to desire increased contact with pharmacists. Consultants responded favourably to clinical pharmacists in another study, but consultants who did not have a pharmacist on their ward round responded less favourably than those consultants who had a pharmacist on the ward round \(^{(15)}\). When surveyed, nurses have had favourable opinions of pharmacists on wards \(^{(12,13)}\).

Hospital pharmacists have developed services in clinical areas where there is a need for pharmaceutical support. Using prescription monitoring as an example, studies have investigated the process, acceptability and economic considerations. The next section identifies a need for pharmaceutical input at the interface between primary and secondary health care, and how pharmacists have responded.
1.2. The Interface Between Primary And Secondary Care.

1.2.1. Introduction.

An increasingly recognised aspect of healthcare services related to the movement of patients between different healthcare environments. The most common example is patient transfer between primary care (community) and secondary care (hospitals). However, movement within the community such as respite care and intermediate care, and also within hospitals as in transfer of patients from a district general to a specialist hospital are also acknowledged. This thesis specifically explores the primary/secondary healthcare interface.

Of paramount importance is the recognition of the interface as a multi-directional, multi-faceted pathway. Hence, information must flow equally well from primary to secondary as from secondary to primary care, and should correlate with patient movement. Furthermore, there is a need to recognise all the key players providing information and participating, albeit to different extents, in the pathway. Obviously, the patient is the focus of the healthcare service, but the spouse and other relatives’ as well as non-family carers’ needs’ should be considered. Healthcare professionals at the forefront of the interface have historically been hospital clinicians and general medical practitioners, but may now include other professionals such as hospital and community nurses, midwives, social workers, pharmacists, occupational therapists and physiotherapists, and this list is by no means exhaustive.
The importance of close links between primary and secondary healthcare providers is now widely recognised when prescribing drug therapies. Furthermore, adequate information must be communicated to the patient in order to help them to take their medication appropriately. Deficiencies within this complex system exist and descriptions have centred on the patient care system which comprises patient admission or referral, inpatient or outpatient care, discharge and follow-up. Problems at each stage of the patient care system will be discussed in depth and communication deficiencies will be explored. Specific measures purporting to resolve interface problems will be appraised.

1.2.2. Patient Care System.

Within most U.K. hospitals, the system for acute health care provision is represented by two models, the inpatient model and the outpatient model (refer to Figures 1 and 2). The outpatient model requires the patient to arrive for consultation with a hospital specialist, usually after referral from their own general practitioner or after discharge from hospital. The consultation commonly takes place within a clinic setting at the hospital and the patient may also interact with clinic nurses, require blood tests or other investigations and be issued with a prescription which may be presented to the hospital pharmacy. The inpatient model is more complex and requires the patient to be admitted onto a hospital ward and occupy a hospital bed. The model consists of an admission stage, which may be preceded by a pre-admission stage, the stay in hospital, discharge and post-discharge. The patient is admitted to the ward as an emergency, via casualty
Figure 1. Patient Care System: Outpatient Model.

<table>
<thead>
<tr>
<th>Location</th>
<th>Community</th>
<th>Hospital</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Referral by GP</td>
<td>Hospital appointment</td>
<td>Seen by GP</td>
</tr>
<tr>
<td>Medication related issues</td>
<td>Drug history detailed in referral letter to hospital</td>
<td>Drug history confirmed by hospital doctor Medication initiated/discontinued/ altered by hospital doctor Discharge medication dispensed in hospital pharmacy Medication changes detailed in clinic letter to GP</td>
<td>Medication continued/amended by GP</td>
</tr>
</tbody>
</table>
Figure 2. Patient Care System: Inpatient Model.

Location          Community          Hospital          Community

Activity                      Elective admission  

Under care of consultant team  

Discharged to GP

Emergency admission  
(via GP/casualty)

Hospital stay

Medication related issues

| Drug history detailed in referral letter if available | Drug history confirmed by hospital doctor  
Medication initiated/discontinued/altered by hospital doctor. Discharge medication dispensed in hospital pharmacy  
Medication changes detailed in discharge letter to GP | Medication continued/amended by GP |

21
or their own GP, or as an elective admission. Patients may bring some or all of their medication into hospital, and if the GP provides a referral letter, this may document the current drug therapy. On discharge, medication is supplied by the hospital pharmacy upon receipt of a prescription completed by the hospital doctor. The prescription is often an integral part of a discharge summary which includes diagnosis, treatment and further management and is generally completed by hand by a doctor and sent to the GP. In some hospitals, a formal dictated and typed discharge letter is sent to the GP after the patient has been discharged. Post-discharge care is generally undertaken by the GP who will continue or amend drug therapy, but the patient may also have to return to hospital for further investigations or to the outpatient clinic which may result in further modification of drug therapy.

1.2.2.1. Admission and Referral

It is necessary to determine the current drug history for all patients. Two sources are generally used, firstly verbal communication with the patient themselves and secondly communication with the GP, which is generally written in the form of a referral letter from the GP. An accurate, comprehensive drug history, noting treatment failures and responses, will aid the clinician when deciding future treatment. For inpatients, the drug history is frequently undertaken by junior medical staff.
However, hospital clinician acquired drug histories may be inadequate and incomplete (26-28), and this can be attributed to a number of causes:

- least experienced doctor undertakes drug history,
- lack of familiarity of medication and common dosages by junior doctors,
- poor recall of current medication by patients,
- transcription of drug treatment from instructions on drug containers which may not relate to actual medication consumed,
- patient reluctance to admit poor adherence to treatment to doctor,
- overlooking over-the-counter (OTC) medication as being unimportant by patient and/or doctor,
- patient too ill to communicate effectively,
- lack of time to undertake a full history or chase up missing information (oncall).

As many as 34% of drug charts were found to contain mistakes relating to incorrect transcription of the patient’s regular medication (29). Errors included complete omission of drugs as well as incorrect doses. On admission to an Australian hospital, patients were found to be taking a mean of five drug items, and a mean 0.5 drugs per patient were omitted by the admitting physician, with a further 0.3 errors in dose or dose frequency per patient (30). Inadequate drug histories have the potential to exacerbate problems when patients are subsequently discharged.
Amongst one hundred patients admitted to an ophthalmology unit, the GP notification of drug history differed from the patient’s actual medication in over 50% of instances (31). Out of 76 patients who were taking prescription medication, 35 patients were taking prescription medication that the GP did not report. Furthermore, patients had been referred to an eye hospital and for thirteen out of the seventeen patients with glaucoma the correct treatment was not notified. The GP referral letters were inaccurate in eighteen out of forty one patients attending a cardiac clinic (32). The drug history was omitted in the GP referral letter for 36% of patients attending a gastro-enterology clinic, and drug history acquisition at the clinic was hampered by the fact that only 13% of patients had brought their medication to the clinic (33). However another study found that drug history was ‘present’ in 88% of referral letters to a medical unit, although the completeness of the drug history was not examined (34).

In terms of accuracy and completeness of drug history, researchers have identified, using a pharmacist undertaken formal drug history interview with the patient’s medicines available to be the gold standard, that telephone contact between the hospital doctor and general practitioner revealed the most information on actual medication, followed by GP referral letter and that hospital drug history records was the least accurate record (35). GP records and hospital records differed in 70% and 76% respectively from the record obtained by interviewing medical patient with their medicines at a general medical clinic (36).

Errors and omissions in the drug history may affect the clinical management of the patient. A review of 100 elderly patients, found that in 93% there were
errors/omissions/adverse drug reactions and or interactions in the drug therapy prescribed on admission (37). As a result eight patients were suffering from an adverse drug reaction which was not noted since the offending drug was omitted from the record. In another study, 172 errors were reported and assessed by a multidisciplinary team. Omissions of drugs accounted for 46 of the 172 errors, which in the assessment could have caused deterioration in the patient's condition, and three errors were assessed as potentially life-threatening (37). In one report, an incomplete drug history led to a patient undergoing unnecessary laparotomy, complicated by pneumothorax (38).

1.2.2.2. Discharge

The processes that occur when patients are discharged are prescription writing, dispensing of medication, receipt of medication by patient and provision of medicines related information to patient and primary care provider, usually the GP. In the UK unstructured discharge letters and separate prescription forms for discharge medication have been replaced by structured, standard forms which include the discharge prescription (39), particularly for initial discharge correspondence, which is sent to the GP when the patient is discharged. Occasionally, these are supplemented by a typed, and detailed dictated summary which is sent later. Waiting for discharge medicines from pharmacy has been given as a reason in 22% of patients in whom the discharge was delayed (40). In general, the delay often occurs earlier in discharge prescription writing process.
Medication is supplied to patients leaving hospital to ensure continuity of treatment. The supply should be sufficient to cover the patient’s needs until they receive a further supply from their GP. Discharge medication is generally prescribed by a doctor, but the proportion of patients receiving a discharge prescription may vary. An investigation into the proportion of discharged surgical patients receiving discharge medications revealed that 30 out of 56 patients were given discharge prescriptions (41). The authors found that the decision as to whether a discharge prescription was required was determined by nursing staff questioning the patient. The high proportion of surgical patients discharged without a prescription may be explained by the likelihood that there may be fewer changes to existing medication in surgical patients compared to medical patients since drugs are the main medical intervention whereas surgery is the primary surgical intervention.

In one study, of 408 patients supplied with discharge medication, only 69% contacted their GP within seven days, and 72% within ten days. There was no contact at one month of discharge in 20% of patients (42). Another study investigated the impact of a change in policy from a fourteen to a seven day supply of discharge medication and a change in format of the discharge letter (43). They found no difference regarding continuity of treatment between a seven and a fourteen day supply.

Prescribing errors occurring in discharge medication have been quantified in the U.S.A. (44) and an error rate of 5.8% detected, with errors most frequently being attributed to wrong dosage schedule and missing information. In the U.K.
discharge prescriptions are generally checked against the drug chart by a pharmacist. Delays in patient discharge from hospital are occasionally blamed on delays in the preparation of discharge medication, but this may be due to queries which need to be resolved before the prescription can be dispensed. In Ireland queries occurred in 25% of discharge prescriptions, 88% of which necessitated contact with the prescriber \(^{(45)}\). As a result, mean pharmacy processing time rose from eight minutes for a prescription that did not require intervention to twenty five minutes for a prescription where the doctor was contacted. 62% of all errors related to poor prescription writing technique (no strength, no frequency, vague directions, illegible prescriptions and controlled drug errors). Interventions were required before 19% of discharge prescriptions could be dispensed in a UK hospital \(^{(46)}\). 21% of 257 discharge prescriptions dispensed for both acute and long stay medical, elderly care and surgical wards required intervention due to errors or omissions, the most frequent errors were incorrect dose (31%) and omissions (22%) \(^{(47)}\).

It has been suggested that discharge prescription monitoring is undertaken by the ward pharmacist instead of by the dispensary pharmacist \(^{(48)}\). Wards pharmacists made more interventions than would have been identified by dispensary pharmacists (68 versus 42) and this was attributed in part to their greater knowledge of the patient’s medication plans. Furthermore, a reduction in delay on prescription processing was identified.

Errors in discharge prescription may increase as the total number of drugs prescribed to a patient increases \(^{(30)}\). In patients prescribed a mean of 4.8 (+/- 3.5)
drugs on discharge, there was a mean omission of 1.38 (+/- 2.04) drugs per patient. These omissions were drugs that were prescribed on the inpatient drug chart but not on the discharge prescription and can be regarded as errors in transcription.

1.2.2.3. Following discharge

Following discharge it is assumed that patients take their medication as directed on the discharge supply. However, drug regimen errors occurred in 50% of patients, prescribed four or more drugs, within one month of discharge from medical wards in a U.S.A. hospital (49). Frequent errors types described were addition of deleted drugs in 32% and incorrect dose/dosing interval in 18%. There was a tendency for patients taking more drugs on discharge and those having more medication changes in hospital to have more errors. Similar findings have been reported in a British study (50) where medical patients were visited ten days after discharge. The GP was contacted and information on drug modification was requested. The authors reported an error rate of 51%, which they classified as being due to either non-comprehension or non-compliance. A correlation between non-comprehension and the number of doses prescribed, and between non-compliance and the number of drugs prescribed was found. The clinical significance of errors was not determined. A lower proportion of deviations from the prescribed regimen was found in fifty patients discharge from medical wards (51). Eleven patients had deviated from the regimen prescribed on discharge, five of whom were determined to have poor comprehension, and six to have a good understanding of their medication. Differences in medication have been classified
by other researchers as being either intentional i.e. occurring with professional intent, or unintentional i.e. occurring without professional intent (52). One week after discharge from medical wards an unintentional discrepancy rate of 11% was observed, which rose to 46% six weeks after discharge. The authors concluded that most discrepancies occur in supplies obtained after hospital discharge. In another study almost two thirds of medical patients had changes in medication seven days after hospital, with 34% attributed to an inadequate drug history on admission or counselling on discharge, 43% due to poor communication between hospital and GP, and only 23% of changes having been initiated by the GP (53). Patients had felt that they received adequate information about drug treatment (65%) and had had an opportunity to ask questions about drug treatment (84%). This highlights an anomaly between patients’ satisfaction with information given and problems encountered.

If medical patients experience problems with medicines, then it can be assumed that elderly patients would also have problems. Elderly patients may have other difficulties, especially with memory, manual dexterity and confusion, which combined with a high number of chronic disease states and the likelihood of polypharmacy may exacerbate problems. In one, frequently cited, study, forty five out of fifty elderly patients had deviations in medication within two weeks of discharge (54). Differences in medication were due to cessation of therapy in eleven patients, change in dosage in ten patients an initiation of new drugs in twenty patients. Changes included name of medication from generic to brand, direction for taking, dose and the taking of drugs that had been discontinued by the hospital. Not all changes were made intentionally by the GP. The author
recommended closer links between hospitals and primary care professionals, possibly by a hospital based liaison pharmacist.

To what extent do GPs contribute to medication changes? In a German study, investigators found that GPs continued 66% of drugs to chronically ill patients on discharge from hospital (55). 21% of drugs were switched to alternative agents (the majority of which were generic switches) and 13% of drugs were discontinued by GPs. In addition, GPs prescribed 18% more drugs than prior to admission. The authors called for greater communication and collaboration between hospitals and GPs not only regarding individual patients but also by establishing joint prescribing committees.

Medication changes occur after discharge, but changes to medication made by general practitioners are generally considered to be acceptable and clinically appropriate. GP initiated changes have been assessed for appropriateness (56) and the authors found that there were changes to medication in 80% of general medical patients within four weeks of hospital discharge. All changes made by GPs were scrutinised and 35% of medication changes made by GPs were considered to have no clinical justification.

Complicated discharge prescriptions may also contribute to discharge problems. The number and complexity of discharge prescriptions issued to elderly patients on medical, elderly and surgical wards has been determined (57). A difference in the number of items was observed for discharge prescriptions issued to elderly versus medical or surgical wards (mean number of drugs 3.55, 2.99, 2.48 on
medical, elderly and surgical wards respectively). A complexity factor was calculated for each item which considered additional instructions and the number of dose administration times is greater than one. The mean complexity factors were 10.54, 12.57, and 8.58 for elderly, medical and surgical ward patients, indicating more complex discharge prescriptions from medical compared with elderly wards, and less complex discharge prescriptions from surgical compared with elderly wards. The complexity of drugs on admission and medication changes were not considered.

Changes to medication name and dose are not the only relevant differences observed after patient discharge. It has been found that 47% of medication was inappropriately issued in child resistant containers (CRCs) in elderly patients discharged from a rehabilitation unit, and 28% of prescriptions were inaccurately labelled. A new prescription was not issued for 27% of patients and of those issued, new drugs had been initiated in 11% and omitted in 13%. These problems occurred despite an attempt to improve communication to GPs by telephoning the surgery on the day of discharge and posting the discharge summary in addition to giving a copy to the patient to take to their GP.

One problem which becomes apparent after hospital discharge relates to inappropriate duplication of medication. When patients are admitted into hospital, they may be discouraged from bringing in their existing medication. This may result from past experience of confiscation and subsequent destruction of their medication. The extent of destruction of patients' own medication is discussed later and it is likely that the patients' concerns about destruction are well founded.
There are two repercussions when a patient does not bring existing medication into hospital, firstly inadequate recognition of a patient's current drug regimen by hospital health care workers and secondly, the opportunity for the patient, to continue to medicate with drugs that have been stopped by the hospital once they are discharged home. These points are highlighted in a study (54), where researchers found that eighteen patients were taking forty drugs that had been issued prior to hospital admission, and fifteen patients continued taking twenty six drugs on their own judgement, which included six drugs that had been stopped by the hospital, and twenty that the hospital staff had been unaware of. One example cited was where tiaprofenic acid, which had been stopped in hospital and ranitidine commenced, was restarted by the patient. Comments were made (59,60) that a five day supply of medication had been made and that five days was insufficient time for GPs to review the prescription and initiate a further supply.

Ascertaining patients' experiences' relating to medication when discharged from hospital further explores the issues in the primary/secondary care interface. For elderly patients problems can be severe. 17% of elderly patients reported difficulties taking medicines (61) and only 23% recalled being given information about their medication and 4% recalled receiving written information on medication. Overall, there was little co-ordination of discharge planning with poor assessment of patient need, with the result that patient and carers received little information to enable them to cope in the post discharge period. Patients' knowledge of medication after discharge is described later.
Finally, these problems are not specifically limited to patients moving from one health care environment to another. A study investigated problems experienced by people in the community\(^{(62)}\) and found that, of patients using medication, 52% reported difficulties in using containers, with most difficulties arising from foil covered containers and eyedrop bottles.

### 1.2.3. Communication Issues.

Communication is a principal factor in promoting effective, seamless provision of pharmaceutical services. Communication issues may be categorised into interaction with health care professionals and interaction between health care professionals and the patient. With regard to inpatients, pharmacy related discharge arrangements in hospitals have been described by two surveys of all hospitals in England in 1995\(^{(63)}\) and 1999\(^{(64)}\) and of all districts in Wales in 1995\(^{(65)}\). Interim discharge letters are hand written and the discharge prescription may be included or a separate discharge prescription may be written. Inclusion of the discharge prescription is more popular with all types of hospital, namely teaching, general and specialist hospitals.

#### 1.2.3.1. Communication Between Health Care Professionals: Hospital – GP Communication.

Communication between the hospital and GP occurs on admission and discharge, and problems in communication when patients are admitted or referred to hospital have been described earlier in section 1.2.2.1. This section will focus on communication at the discharge phase. In general the content, format and receipt
of discharge correspondence have been severely criticised (66-72). Of eighty six patients, from one practice who had an inpatient stay in hospital in a six month period, initial discharge letters given to the patient to deliver to their GP were not received by GPs in eighteen instances, with an average delay of 4.3 days (68). Posting typed discharge summaries resulted in non-receipt for twenty six patients and an average delay of 20.8 days was noted. Allocation of time for hospital doctors to undertake this activity was recommended. Delay in receipt of discharge information was shown not to be the primary reason for readmission of elderly patients, but as shown to be a contributory factor in forty nine of the 133 readmissions (67). In thirty of the patients who were readmitted there was no discharge letter after ten weeks, compared to eight patients who were not readmitted for whom discharge letters were not received after ten weeks (67). In another study, 14% of discharge summaries (first communication) were received five weeks after discharge. GPs were asked whether this affected their management, and in 24% of cases, GPs felt that the delay in receipt of the discharge summary in addition to a lack of content affected their management of the patient and was solely responsible in 10% of cases (71). In another study, 8% of the first communication were not received in three weeks, and the second communication (consultant discharge summary) was not received within three weeks in 62% of cases (76). Information in the second communication was more thorough and accurate than the initial communication, but delays in receipt of both by GPs were noted (73). In some instances, GPs do not receive discharge summaries for the simple reason that they have not been prepared by the hospital doctor. Newman found that no discharge summary was prepared for 43% of 88 patients discharged (74).
Incomplete information provision to GPs may contribute to changes in treatment. With regards to discharge medication, 42% of GPs who had contract with one Kent hospital felt they received too little information (75) and over half felt that this was true of information provided to patients and only 55% of GPs considered that the information was adequate. Inadequacies highlighted included illegible discharge summaries, lack of duration of treatments and lack of information regarding changes in medication. The latter was cited by 88% of GPs. A similar study (76) revealed that 96% of GPs wanted information on medication changes made by hospitals, primarily to facilitate continuity of care. Other reasons cited as to why GPs want information on reasons for changes to treatment are to facilitate patient counselling, to alter or query hospital prescribing and financial considerations. Another study reported a complete absence of information on drugs supplied on discharge in 90% of first communications and second communications respectively, and under-reporting of drug reactions in hospital (77). The authors did not describe the discharge documentation and it is probable that in this case the discharge prescription was not included in the discharge letter. In a more recent study, discharge treatment was reported in 88% of first and second communications received in one practice and in 78% and 94% of first and second communications received in another practice (66). Medication was not recorded in 18% of discharge correspondence and there were discrepancies in information transmitted via the first and communications where differences occurred in 9 (14%) of communications, with differences in drug name (generic/non-generic), doses and drugs. Data was limited since 62% of second communications were not available for scrutiny. General practitioners have
specified the importance of selected items of information for patients receiving chemotherapy (78). Items considered essential by GPs include details of drugs used (82%), dose of drug (68%), and potential side-effects (41%) and these were covered in 100%, 89% and 5% of discharge letters received. Knowledge of side effects of chemotherapeutic drugs is necessary to ensure appropriate patient monitoring and lack of provision of this data may appear to put the patient at risk.

1.2.3.2. Communication Between Health Care Professionals: Hospital Pharmacist – Community Pharmacist

Few studies have examined the level of communication between hospital and community pharmacists. The available evidence suggests that community pharmacists receive little information when patients are discharged from hospital (79-82), although to be fair to hospital pharmacists, there is a similar lack of formal communication when patients are admitted to hospital.

A survey of hospitals in the U.K. undertaken in 1995 revealed that only 21% of hospital pharmacy departments provided written information to community pharmacists (63). In a later survey, published in 2000 95% of hospital pharmacy departments never communicated with community pharmacists or did so in less than 10% of discharges (64). Reasons given by hospitals for not providing information included lack of time and lack of resources. This confirms reports of community pharmacists who feel that they receive too little information in general and rarely information on medication changes (75,79,80). 60% of community pharmacists readily gave examples of situations where problems were experienced due to poor communication, but only 15% could identify examples of seamless
care that had worked well (80). The results of these surveys have been confirmed by an observational work sampling study of hospital and community pharmacists which found no contact between hospital and community pharmacists (81).

1.2.3.3. Communication with Patients

Before exploring issues regarding communication with patients at the interface, it is appropriate to first ask why is it necessary to communicate with the patient, who should communicate and also how to communicate effectively and what information to provide.

Why?

The concept that patients are passive consumers of healthcare with health care professionals acting in a paternalistic manner is outmoded (82-85) and it is unreasonable to expect people to want to know nothing about their medication. There are a number of valid reasons for providing medicines-related information to patients that apply equally to provision of information on discharge and whenever and wherever medication is prescribed. There is good evidence to support the hypothesis that patient counselling enhances the patient’s ability to take medication by improving their medication knowledge and this will be discussed later. That patients desire more information on their medication is an aspect of patient empowerment. Legislation has also demanded improved patient information. Legal considerations include an obligation on the part of the doctor to give information as patients have the right to receive information on drug
therapy as extolled by the Patient's Charter. Despite this, it has been argued that physicians and pharmacists maybe reluctant to provide information to patients (85). European legislation recognises a patient's right to information on medication and since January 1999 there is a legal requirement for all medicines to supplied with a comprehensive information leaflet for patients (86).

Who should be providing information on medication?

Having determined that the provision of information on medication to patients is essential to promote concordance, the next question is who is best able to undertake this. There are legal, professional and ethical considerations (87). The doctor has a duty of care to the patient and may be legally liable if they fail to inform the patient of the risk of a treatment. However, it is unclear exactly how much information should be given and it is left up to individual doctors to decide. Any health care professional with direct involvement in prescribing, supply and administration of drugs should be regarded as a potential source of information. Hence, prescribers, pharmacists and nurses are all suitably placed to provide the patient with information on medicines. Drug manufacturers are suppliers of drugs and the availability of manufacturer produced patient information should not be overlooked and the media also has an increasingly more important role to play, but these two sources of information will not be considered here. Nurses have a role in counselling patients (88) and are reported to be more involved in providing elderly patients with information on discharge medication than pharmacists (89). However, health care professional perception of the provision of information may differ from the patient's view of information received. In one study, ward sisters
said that elderly patients routinely received medicines related information on discharge, whereas only 4% of patients reported that they had received written information \(^{(61)}\). In another study, 95% of nurses believed that patients received discharge medication counselling \(^{(90)}\).

How should information be relayed?

Information can be supplied in one of two ways, verbally or printed. Different patient groups have different needs and it also necessary to 'individualise' information. Patients may be grouped according to their age or disease state. The problems faced by elderly patients may relate to slower cognitive functioning, reduced short-term memory and impaired visual acuity and manual dexterity. For example, a quarter of elderly patients may be unable to read a standard computer generated medication labels \(^{(91)}\). Since elderly patients consume a large proportion on medication (in 1990 43% of prescriptions issued in the U.K. went to elderly patients), research strategies have been adopted to overcome, partly problems faced by the elderly. In addition to having difficulties taking medication, elderly patients may not be able to remember exactly what they ware taking, and one study found that only 10% of patients were able to recall all drugs that they were taking \(^{(92)}\).

Counselling has been shown to improve recall of medicines after discharge \(^{(93)}\) and errors made with medication after discharge in the elderly \(^{(94)}\). Although one early study found no difference in error rates \(^{(95)}\). Written information in the form of a computer generated reminder chart improved patients’ knowledge (83% with
chart versus 47% without chart correctly described their medication regimen) and increased compliance which was increased further with verbal counselling \(^{(96)}\).

What Happens in Practice?

Although measures such as counselling and the provision of written information have been advocated, there is evidence that this does not occur in practice. Written information was provided to 14% of outpatients who had received specific drugs \(^{(97)}\). Only 32% were informed of side-effects although most patients were told the dose and dosing interval. Patients discharged from medical and surgical wards were shown to have poor knowledge of side-effects or duration of treatment, although most (over 80%) patients were able to read and understand instructions \(^{(98)}\). Poor recall of medication was associated with increased age, mental score, and number of drugs prescribed \(^{(92)}\). Medicines were correctly described for 75% of drugs prescribed to elderly patients \(^{(99)}\). A survey of the reported level of provision of certain services to elderly patients questioned all hospital pharmacies in England and received a 68% response \(^{(100)}\). The authors found that 2% of respondent hospitals counselled all elderly patients before discharge, 28% counselled no elderly patients and 27% provided all elderly patients with written information about their medication \(^{(100)}\).

1.2.4. Potential Solutions To Problems.

Pharmacy discharge has been described as ‘the process whereby a patient is moved from one care environment to another with the assurance that all
pharmaceutical requirements, including information, can be communicated and maintained in a safe, timely and user-friendly way' \(^{(101)}\), and from the evidence cited earlier it is clear that this does not always occur in practice.

There are three initiatives that can be described which aim to reduce difficulties when patients are moved between primary and secondary care:

1. Rationalisation of prescribing.
2. System orientated measures (improve patient admission/discharge procedures and communication between health care professionals).
3. Patient orientated measures (improve communication between health care professionals and patients).

1.2.4.1. Rationalisation Of Prescribing

Since some medication changes in hospital can be attributed to hospital formulary choices joint prescribing formularies have been proposed. Such formularies may be co-ordinated by an 'interface pharmacist' \(^{(102,103)}\) whose responsibilities would include shared care prescribing, interface consensus groups and disease management guidelines. A similar role has been given the title 'pharmacist facilitator' \(^{(104)}\).

1.2.4.2. System Orientated Measures

Improvements in the processes by which patients are admitted to and discharge from hospitals have been achieved by improving and developing communication
pathways and by the use of measures such as dedicated interface roles and protocols.

As discussed earlier, discharge prescription monitoring by ward pharmacists may be beneficial (98). Comparison of drug charts and discharge prescriptions have shown that over half required intervention by a pharmacist (105). In an American study, pharmacist intervention was required in 38% of discharge prescriptions (106). Clinical pharmacist screening of discharge prescriptions led to a change of therapy in 56% of interventions compared with 14% and 17% of interventions made by dispensary pharmacists (107) and clinical pharmacists took less time to resolve problems with an average of 3.5 minutes per prescription for clinical pharmacists and 5.3 minutes per prescription for dispensary staff.

In several hospitals, clinical pharmacists are transcribing the discharge prescription, with the doctor checking and signing the prescription (108,109) which has improved the efficiency of the discharge process and reduce errors on the discharge prescription (110).

Concerns about delays in patient discharge resulting from pharmacy processing of discharge prescriptions have resulted in the issue of prescriptions instead of medication to patients (111). Patients were free to have the prescription dispensed in the hospital or community. 27% of patients did not have the entire prescription filled and this was primarily due to the patient having a sufficient quantity of the existing supply. However, similar arrangements for issuing prescriptions to paediatric patients have been criticised because of the potential for errors to occur,
which may due to a perception of the community pharmacist’s relative lack of knowledge of paediatric therapy and of the individual patient’s treatment plans\textsuperscript{(111)}. Circumventing the hospital pharmacy at discharge arguably increase the potential for drug errors. One study assessed discrepancies between the discharge prescription written by the hospital physician, the discharge instruction sheet (DCI) completed by the nurse who also counselled the patient, and the medication dispensed by the community pharmacist, for 388 paediatric patients discharged from an American hospital. In 19% of patients, the discharge prescription, DCI and the dispensed medication were not identical, accounting for 12% of prescriptions. In 5% of initial prescriptions there were omissions or inaccurate information. Hence, providing patients with prescriptions instead of medication may not be advantageous, despite a study where some patients regarded this as their ideal choice\textsuperscript{(112)} due to perceived reduced waiting times, convenience and the possibility of shopping whilst waiting for the prescription to be dispensed. Only 2% of patients commented that prescription queries were more easily resolved in the hospital pharmacy.

Other system improvements are aimed at improving communication between the hospital and the GP and developing communication pathways between the hospital and community pharmacist, but communication between the GP and community pharmacist is also worth consideration.

Communication between hospital and community pharmacists has been proposed as a measure to improve the provision of a seamless approach to pharmaceutical services\textsuperscript{(113,114)}. In 1993, the hospital pharmacists group of the Royal
Pharmaceutical Society produced checklists for hospital admission and discharge, to be completed by community pharmacists to provide information to hospital pharmacists when patients were admitted and vica-versa on discharge. Information provided by the community pharmacist included patient demographic data, prescribed and non-prescription medication history and domiciliary circumstances. The hospital pharmacist provided information relating to the patient’s medication plan, whether any existing medication had been stopped or altered and the reasons for such changes, and details of discharge medication. Assessment of the form found that benefits included identification of medicines related problems and subsequent intervention for 25% of elderly patients, of which 68% were judged to be clinically significant. Perceived problems included that the forms were time consuming to complete, there was increased paper workload and there was difficulty in tracking patient transfers. Utilisation of the checklist to solve medication problems may not readily occur. When data on 68 Pharmaceutical Society checklists sent from hospital to community pharmacists were analysed, thirty three problems were identified. In twenty five (37%) prescriptions, nine were resolved by contacting the GP and eight were resolved without contacting the GP. It was noted with concern that no intervention was made by community pharmacists in nearly half of the cases where problems were identified including nine cases where drugs were omitted, three cases where there was failure to discontinue drugs, two wrong drugs and two wrong doses. This may indicate a need for training of community pharmacists before the checklists fulfil their full potential. Despite potential advantages, there is evidence that the Pharmaceutical Society checklists are not used extensively in practice. When thirty two hospitals were asked whether they used the
Pharmaceutical Society checklists only 4% responded affirmatively and 72% responded negatively\(^{(63)}\). Awareness of the existence of the checklists amongst community pharmacists was poor, at 29% for community and 75% for hospital pharmacists and several potential problems with using the form were identified including lack of time. Hospital and community pharmacists did agree on the usefulness of such checklists for specific patient groups such as elderly patients, patients on complex medication regimens and mentally ill patients\(^{(116)}\), and the original checklists were designed with vulnerable patient groups in mind. One of the main difficulties of sending patient’s information to the community pharmacist is the potential to limit the patient’s freedom to visit any pharmacy.

Other types of document to enhance the communication of medicines related information, such as typed and written pharmacy information letters have been described. A pharmacy information letter was shown to reduce medication management problems experienced by elderly patients after discharge\(^{(117)}\). The letter was completed by a hospital pharmacist and included information on medication changes and drug allergies in addition to listing any problems in opening containers and was given to patients, and sent to the GP, the community pharmacist nominated by the patient and if necessary to the community nurse. Interestingly, the perceived usefulness of the pharmacy information letter differed between health care professionals, with 29%, 79% and 82% of GPs, community pharmacists and community nurses respectively finding the letter useful or very useful. GPs showed a poor positive response to the pharmacy letter, whereas there was a reduction in problems experienced by patients. Perhaps this indicates an unawareness amongst GPs of the problems faced by patients recently discharged
from hospital. In a Canadian study, information was prepared by the hospital pharmacist and forwarded to the GP and community pharmacist \(^{(118)}\). The information that was prepared took the form of two summaries, a 'rationale for inpatient changes' (RFC) document which detailed medication changes made by hospital personnel and noted the reasons for changes, and a 'recommendation for future changes' (RFC) document which included alterations in dose or drug that should be considered for future management. The former document was sent to both GPs and community pharmacists and the latter to GPs only. GP response was mostly positive with an intention to follow the recommendation in 23 out of 27 letters. The two types of summaries were time consuming to prepare, taking an average of 45 minutes for the preparation of the RFC and 91 minutes for the RFC summary.

Greater utilisation of the currently available computer technology to produce information on discharge medication would resolve illegibility issues and may consume less resources in terms of staff \(^{(119,120)}\). Discharge practices in one hospital in the U.K. \(^{(121)}\) rely on computer generated lists of dispensed discharge drugs being sent to GPs and computer generated drug reminder charts to patients. The dispensing program provides all relevant data, hence duplication of data entry is avoided. Discharge medication are dispensed from interpretation of instructions on the drug chart and this avoids the problems associated with incorrect transcription of drugs to a separate discharge prescription. This mechanism has streamlined the discharge medication process and was reported to decrease dispensary processing time of discharge medication. Reductions of one third in dispensary processing time of discharge drugs were reported by evaluation of
computer generated discharge prescriptions for surgical patients in the U.S.A.\textsuperscript{(122)}. When compared to hand-written discharge drug prescriptions computer generated prescriptions decreased the number of legal and prescribing errors in addition to decreasing dispensary processing times. A study in the USA similarly investigated use of computer generated discharge prescriptions, this time for medical patients\textsuperscript{(123)}. The computer program was accessed voluntarily by physicians and there was a tendency to use it for older patients. The computer system was regarded as making it easier to order medication by 68\% of doctors using the system, and to save time by 41\% of doctors. Similar findings were reported in another study\textsuperscript{(124)}.

The extension of hospital computer prescribing systems to order discharge medication is reasonable but at the time of the study few hospitals in the U.K. had computerised prescribing. Pharmacists accessing computerised prescribing systems in hospitals increase to order discharge medication was found to increase the efficiency of the discharge process by reducing the proportion of urgent requests and the need for clarification of the discharge prescription\textsuperscript{(125)}. Electronic data interchange between GPs and community pharmacists and better IT systems in hospitals are planned, but patient specific electronic communication between primary and secondary health care workers may take longer. The use of fax machines to act as vectors for communication of discharge medication has more potential in the U.K. so that medication summaries prepared by hospital pharmacists can be faxed to GPs and community pharmacists\textsuperscript{(126,127)}. The use of information technologies at the primary/secondary care interface will be discussed further in the discussion in view of recent NHS reforms.
The pharmacist has been promoted as educator, co-ordinator and navigator (128). A dedicated admissions pharmacist uses all of her clinical skills to improve the quality of information regarding medication when patients are admitted into hospital (129). Pharmacists who develop a role in discharge planning have found that they are consulted more about other matters as their ward exposure is increased (130). The title 'patients’ medicines co-ordinator' has been given to a pharmacist whose main responsibility is to write discharge prescriptions and counsel patients (131). Benefits have included an estimated reduction of 80 hours per week spent by junior doctors arranging discharge medication and £10,735 saved on the costs of discharge medication to the medical directorate within which the project was undertaken. Discharge co-ordinators are not necessarily pharmacists and comprehensive discharge arrangements require assessment of the patient’s often complex social and nursing needs. A discharge co-ordinator was found to improve the discharge planning service and decrease problems experienced by medical patients after discharge, but did not affect re-admission rates (readmission within seven days of discharge) and the benefits incurred an additional cost (132).

1.2.4.3 Patient Orientated Measures

A wide variety of patient orientated approaches have been tried to promote seamless pharmaceutical care. Specific intervention include pharmacist run pre-admission clinics, pharmacist acquired drug history and examination and reuse of patients’ own drugs’ (PODs), self medication schemes, the provision of verbal and written information to patients and domiciliary visits by pharmacists. These
interventions takes place at all points in the interface, preadmission, admission, discharge and post-discharge. Certain patient groups have been specifically targeted and these include medical, surgical, elderly patients, those with a high number of medication changes and paediatric patients.

1.2.4.3.1 Pre-admission and admission to hospital

Various studies have demonstrated that pharmacists acquire more information on medication than doctors. For example, pharmacists documented 31% more items of information that doctors. Clarification of drug therapy was necessary in 19% of patients following a pharmacist-undertaken drug history. A review of studies reported that pharmacists prepare a more complete drug history than physicians which was due in part to increased documentation of non-prescription medicines. This finding has been confirmed by several other studies. Feedback from doctors has been positive, with 76% of junior doctors supporting this role, but a sizeable minority (24%) felt that it was not necessary or practical.

Further evidence suggests that pharmacists may document more information on drug allergies than physicians.

A complete drug history is necessary in reducing unintended differences in patients’ drug therapies. Other reasons for acquisition of a full drug history include identification of drug-related hospital admissions and to determine what treatments have been successful or unsuccessful in the past. There is a role for pharmacists to undertake drug histories in surgical pre-admission clinics which has the above advantages and also enables preparation of discharge medication in advance. It is acknowledged that pharmacists collect more
information on drugs than doctors, but does this make a valuable contribution to the overall care of the patient? Several studies have attempted to scrutinise the information obtained by pharmacists in terms of the potential significance\(^{(140-144)}\). The first study assessing clinical significance of pharmacist acquired drug histories was conducted in Canada and found that 11% of pharmacist acquired information that had been omitted by doctors were deemed clinically important by an expert panel \(^{(141)}\), whereas this was estimated to be 70% in another study \(^{(142)}\). In the U.K. clinical significance was presumed when 29% of patient interviews necessitated contacting the prescriber and 81% of these resulted in therapy changes \(^{(142)}\).

Methods for drug history acquisition have been described \(^{(26,144)}\). Interviewing patients requires the application of sound communication skills such as the ability to control the interview pace, asking questions appropriately and probing answers whilst relating to the patient’s needs \(^{(145)}\). Accessing the patient’s notes prior to interviewing patients is useful since relevant background information such as previous medical history can be collated. Some authors advocate a review-of-systems approach to drug history acquisition \(^{(28)}\). In general, the following areas have been probed:

- Prescription medication – including name/brand, dose and frequency, indication and date started.
- Non-prescribed medication – including OTC, herbal and homeopathic remedies.
- Allergies and serious adverse drug reactions necessitating treatment withdrawal such as gastrointestinal bleed with aspirin.
- Discontinued medication and reasons for discontinuation.
- Alcohol and tobacco use.
- Compliance with regimen.
- Knowledge of medication.

The last two points are useful when formulating treatment plans and when considering the patient's needs at discharge. Computer resources can be utilised to acquire drug histories.

The timing of the interview is important. Elective surgical patients may ideally be interviewed at pre-admission clinics, and for emergency admissions the interview should take place as soon as possible after the patient's admission. In general, the physician still needs to undertake a drug history on admission. Medical admission units, where patients are admitted and immediate investigation and treatment instigated, have resulted from a need to manage hospital beds effectively. Within such units, pharmacist acquired drug histories can be provided for all medical patients entering hospital and form part of the duties of an admissions pharmacist. Even earlier intervention may be necessary since complete drug histories were obtained by emergency department physicians for only half of elderly patients. Since 67% of consultations resulted in new prescriptions there was a 3.5% rate of potentially significant drug interactions between new and existing medication.

The time required to undertake drug histories may limit the extent to which the service may be provided. The time taken to undertake drug histories has been
reported and varies between 13.5 minutes (+/- 5.1 minutes)\(^{(151)}\) and 15 minutes\(^{(135)}\). A computer initiated patient drug history took 40 minutes\(^{(146)}\). And may be useful since the provision of drug histories by pharmacists often limited to office working hours whereas patients are admitted 24 hours a day.

1.2.4.3.2 Reduction in wastage of drugs.

In the U.S.A. a statement regarding pre-admission drugs in the Joint Commission on Accreditation of Healthcare Organisations Accreditation Manual for Hospitals states ‘if drugs [brought into hospital by patients] are not to be used during the patient’s hospitalisation, they are packaged and sealed and either given to the patient’s family or stored and returned to the patient at the time of discharge, provided such action is approved by the practitioner responsible for the patient’\(^{(152)}\). The Standing Pharmaceutical Advisory Committee reported on extending use and reuse of patient own medicines within hospitals in 1993\(^{(153)}\). It made the following definitions:

Patients’ Own Medicines (PODs): medicines that are the legal property of a patient in that they have been prescribed for or purchased by the patient. Extended Use of PODs: continuing use of PODs by that patient in the hospital or on discharge from hospital. Reuse of PODs: use of PODs by another patient in the hospital or returning to the ward/pharmacy stock with the potential to be used again for another patient.
Its recommendations were:

- Local policies on PODs to be reviewed with all health care professionals involved contributing and patients' opinions' to be considered.
- Patients to be advised to bring all their medication into hospital.
- Halting the practice of automatically destroying PODs, with the destruction of PODs requiring consent, preferably written, from the patient.
- Not reusing patient's medication for another patient, unless in exceptional circumstances [these circumstances are not stipulated].
- Adherence to the principles detailed in the 'Duthie' report.
- Further research to be carried out on the issues involved.

The extent of unnecessary destruction of PODs has been investigated. In an eight week study, 448 items were returned to the pharmacy of a district general hospital for destruction, of which 90% were oral solid dose preparations. The drugs were categorised according to source and the majority were found to have been dispensed by independent community pharmacies. The study did not estimate the value of the drugs.

Reissuing patients' own drugs is not a new concept with consideration being given to reissue in 1983. In this study, a financial commitment of £118 for labour and material resulted in £615 in savings in terms of drug costs. Variable savings to hospitals of between £500 in one year and £550 in ten months have been demonstrated. Hospital savings result from savings accrued by not issuing a hospital supply on discharge when PODs were retuned to the patient. The value of
PODs can exceed this since patients may have several months supply of their own drugs and the cost of drugs in the community may be greater than the hospital costs. No account was made for the costs associated with staff assessing PODs in these studies nor of staff savings associated with a potential reduction in the dispensary processing of discharge prescriptions.

Technicians can have a role in assessing PODs and a pilot study showed savings of £61.37 on discharge medication costs for 15 patients. After a deduction for the cost of technician time, a net saving of £26 was obtained \(^{(158)}\). By extrapolating data, researchers have estimated that between £5,000 and £50,000 per annum could be saved on discharge medication costs alone \(^{(156-160)}\). When staff costs are considered, savings can be lower or cost prohibitive, and one study reported a net cost increase of £6,700 where staff costs, which included pharmacy technicians and assistants, were included \(^{(159)}\).

In addition to staff costs, the proportion of drugs brought into hospital, suitability for reissue and the proportion of PODs reissued is relevant. Medication may not be brought in by all patients and studies have reported that 16\% of patients \(^{(161)}\), 36\% of oncology patients \(^{(162)}\) and 65\% of surgical patients \(^{(163)}\) brought their existing medication into hospital. Suitability for reissue is determined by applying criteria such as whether the drug is dispensed in the original container, can be positively identified and has a legible and accurate label. The proportion of PODs suitable for reissue varies, with reported of 89\% for surgical \(^{(160,163,164)}\) to 25\% for elderly, medical and orthopaedic patients \(^{(163)}\). Reasons for the destruction of PODs include that the drug is longer prescribed or in poor condition. A variation
in reissue rates between medical and surgical wards has been shown \(^{161}\), with higher reissue rates for surgical wards. This may relate to a higher incidence of medication changes in medical compared to surgical patients.

An extension of a PODs scheme where the drugs were returned to patients on discharge is to use PODs whilst patients are in hospital as part of a self-medication programme \(^{165}\). Self medication in hospital has been shown to improve patient knowledge and compliance in elderly patients once they are discharged home \(^{166,167}\), although it may not reduce medication administration errors \(^{168}\). It is important to determine GP opinion on the use of PODs within the hospital since it may not be positive \(^{169}\).

In summary, the advantages of PODs schemes include reduced wastage of drugs and potential savings in drug costs. Other advantages include the opportunity for a more complete drug history, the potential to uncover dispensing errors \(^{170}\), and a reduction in dispensary processing of discharge prescriptions \(^{171}\).

1.2.4.3.3. Patient Counselling and the Provision of Written Information

A report by the Royal Pharmaceutical Society of Great Britain advocated the use of the term ‘concordance’ where ‘concordance is based on the notion that the work of the prescriber and patient in the consultation is negotiation between equals and that therefore the aim is a therapeutic alliance between them.’ The report emphasised the creation of openness with the relationship \(^{172}\). This concept
considers that patients who do not take medication as directed may do so as a result of conscious decision making made by the patient \(^{(173)}\).

Certain patient groups may be targeted for the provision of information. Medication changes in hospital have been cited as a way of assessing the need for interventions such as counselling \(^{(174,175)}\). There is a wealth of studies investigating patient adherence to medicines, the psychology of adherence and the roles of pharmacists in improving adherence \(^{(176-181)}\) and detailed examination of the evidence is outside the scope of this research. The provision of services such as medication counselling \(^{(182,183)}\) and the use of written information such as medication lists or cards \(^{(184-186)}\) and reminder charts \(^{(96,187)}\) on adherence to medication has also been exhaustively investigated. A review of pharmacist-patient communication examined studies published between 1969 and 1994 indicated that although pharmacists increased patient knowledge and compliance, studies on other outcomes such as an improvement in health state were lacking \(^{(188)}\). Pharmacists should aim to tailor information to the information needs of the patients and be aware of psychological considerations \(^{(189)}\).

1.2.4.4. Multiple Intervention Approaches.

Specific strategies have combined interventions in an attempt to realise greater benefits. Intervening on discharge prescriptions may be avoided by using a checklist to aid discharge planning \(^{(190)}\). A checklist is described which prompts the pharmacist to review the patient’s drug regimen, consider packaging and supply, information on medication and liaison in the care of elderly patients \(^{(190)}\).
A combination of discharge counselling and the provision of written information to patients, general practitioners and community pharmacists for patients judged to be at risk of misadventure was evaluated \(^{(191)}\). The authors documented system errors which they defined as being an act or omission by a health care professional in relation to a patient's medication that without correction would result in probable medication misadventure. Although medication was checked for optimal prescribing and simplicity, the mean number of discharge drugs per patient was 6.2. The mean number of medication errors per patient was 0.56, and major or minor interventions were required for 21% and 59% of patients respectively. Since there was no control group, the benefits of this approach over the existing system cannot be determined. Another discharge planning scheme for the elderly has been described involved assessment of the patient's medicines-related needs and completion of a care plan following discussion with other health care professionals in the community and hospital, the patient and any other carers. The care plan was given to the patient and copies sent to the GP, community pharmacist and district nurse, and retained in the hospital medical notes and by the hospital pharmacist. Patients were followed up in the community after discharge, and questionnaires sent to the primary health care professionals who had received a copy of the care plan. The care plan was judged as being effective as it was found that it was utilised by all health care professionals and carers, although whether the care plan reduced errors with medication was not determined \(^{(192)}\). The provision of medicines-related verbal information to elderly patients on discharge, in addition to written information in the form of a pharmaceutical care plan which the patient was requested to show to their GP and community
pharmacist was evaluated in a controlled study by follow up of patients 7-10 days after discharge (193). Investigators reported significantly better compliance levels in the intervention group. Observed medication differed from discharge medication in 14 intervention and 17 control patients (total of 28 intervention and 25 control patients). A pharmaceutical care plan which involved a review of the treatment, packaging and information needs of the patient and liaison with primary health care workers improved medication adherence with medicines from 67% to 76% in elderly patients after discharge from hospital (194).

When undertaking and assessing interventions it should be considered whether the main outcome measure is appropriate. Patient or user satisfaction of different approaches is worthwhile data to collate, but should not be the sole measure. Various measures such as problems experienced with medication or the number of errors associated with medicines have been described. One aim of effective discharge planning is to reduce readmissions to hospital. One medication discharge planning service was evaluated to determine its effect on readmission rates in patients with chronic heart failure (195). The programme was applied to patients by a nurse investigator who provided the patient with verbal and written information on drugs and constructed, on discussion with the patient, a timetable for medication administration that fitted in with the patient’s routine. Attempts were made to identify and resolve any problems that the patient may face on discharge. Control patients received routine discharge counselling from a nurse. The mean age of patients was 72 years and a significant difference in readmissions between groups was found, with 7.7% of intervention versus 28.6% of control patients readmitted within 31 days.
1.2.4.5. Selection of Patients

Elderly patients appear the focus of many medication related interventions. Other patients are also at risk of medication related problems, and a method for identifying such patients has been described (196). The ‘Pharmalert’ system enabled nursing staff to assess the patient’s medication related needs using a scoring system which takes into account the patient’s living arrangements, their condition on admission (e.g. confused, poor eyesight), the number of drugs being taken and any existing medication problems. Patients with a sufficiently high score were referred to a pharmacist who assessed the patient, undertook patient education sessions and liaised with the community pharmacist using the checklist drawn up by the Royal Pharmaceutical Society. This system may useful for identifying patients for whom intervention is likely to be the most beneficial and highlights the usefulness of assessment of patients, since pharmacists may not be in a position to counsel every patient on discharge. Another method for prioritising patients has been to assess the patient’s ability to self medicate safely by undertaking a pharmaceutical assessment which considers factors such as understanding of medication and the ability to open containers and administer doses (197). A pilot scheme found that, of 30 referrals by social workers, 29 patients were assessed and 75% were considered to require some help or complete supervision of medication administration. Help was provided in the form of counselling or written information, which 51% of patients required and dispensing solutions such as large print labels, which 24% of patients required. The average age of patients was 78 and an average of five drugs were prescribed.
Studies have sought to identify ‘at risk’ patients and target pharmaceutical interventions at those patients who have most to benefit, as described above. Furthermore, different patients have different needs from a pharmaceutical service, for example the needs of surgical patients could be met by the use of PODs and the prompt organisation of discharge medication \(^{198}\), whereas for elderly patients the concern is how patients are able to takes their medication once they have returned home. Studies have targeted specific patient groups such as medical \(^{199}\), elderly \(^{200,201}\), surgical, paediatric, those with AIDs \(^{202}\), and those with a large number of medication changes.

This section has explored deficiencies in the primary/secondary healthcare interface and identified how pharmacists have contributed to measures to overcome these deficiencies. The next section describes current changes in healthcare service provision in the U.K. and how these provide an opportunity for pharmacists to fully develop services at the interface between primary and secondary care.
1.3 N.H.S. Reforms and Other Opportunities for Pharmacy

The N.H.S. is the largest healthcare service provider in the U.K. and for pharmacists working within N.H.S. institutions, the structure of the N.H.S. in general and the reforms in particular are key in determining the roles that hospital pharmacists perform. This section recognises how N.H.S. organisational changes up to 1995 have affected hospital pharmacy practice and presents developments in the provision of healthcare in the U.K. that provided opportunities for the development of clinical pharmacy at the interface between primary and secondary care. More recent reforms will be examined later.

1.3.1. The National Health Service and Reforms up to 1995.

In 1998 the NHS celebrated its 50th anniversary. It was founded in 1948 on two principles, quality and equity, i.e. the best health services for all. The National Health Services Act 1946 provided the necessary legislation for the inception of the NHS. The important aspects of the NHS when it was designed were:

- A service to be run on a national basis and paid for out of general taxation and national insurance.
- All citizens to be able to register with a family doctor of their choice and receive free treatment and be referred to hospital if needed.
- GPs received a payment for each NHS patient and had a duty to provide care for their patients.
- Hospital care was free.
• Medication prescribed was free when collected from a pharmacy. (this was subsequently to change with the first prescription charges imposed in 1952). Eye tests, spectacles and dental visits and dental treatments were also free.

The purpose of the N.H.S. has been stated as ‘to secure through the resources available the greatest possible improvement in the physical and mental health of the population by promoting health, preventing ill health, diagnosing and treating disease and injury and caring for those with long term illness and disability’ (On the State of the Public Health 1997 HMSO). Legislative and NHS documents, particularly in the primary/secondary interface, which are relevant to hospital pharmacy will be reviewed.

In 1988 the Department of Health issued a landmark circular. HC(88)54 (1988[GEN]32 was the Scottish Home and Health Department paper) was entitled ‘The Way Forward for Hospital Pharmaceutical Services’. Within this document, clinical pharmacy was described as ‘the developing role of pharmacists in which pharmaceutical skills are systematically applied to medicine usage both at policy making level and in the treatment of individual patients.’ Pharmacists were acknowledged in their ability to counsel patients on drug therapy prior to discharge, albeit at the request of clinicians.

The 1989 Government White Paper ‘Caring for Patients’ indicated that more care for patients would be provided close to their homes, (within the community) and that less patients would require long term hospital care. The number of day case
patients and the numbers of short stay patients was expected to rise. Major reforms in 1991, implemented by the Conservative government, devolved responsibility to local level in a stated attempt to improve services to patients. This devolution created purchasers and providers, where purchasers of health care were health authorities, family health service authorities (FHSAs) and GP fundholders, and providers included NHS Trusts (for acute services, mental and community health services), non-fundholding GPs, community pharmacists, ophthalmic opticians and dental practitioners. The legislative authority for these changes came from The National Health Service and Community Care Act 1990.

These reforms aimed to drive efficiency into the NHS by enabling market forces to operate. The reforms also shifted the focus of healthcare provision from a hospital based philosophy to one in which primary care took the lead. This resulted in a primary care led NHS where adequate communication between primary and secondary care personnel was vital and there was an increased awareness of the inefficiencies in the primary/secondary care interface.

1.3.4. Other Opportunities for Pharmacy Involvement at the Interface.

In 1991, an executive letter from the NHS Management Executive focused on prescribing between hospitals and general practitioners (203). It brought specific issues regarding prescribing policies to the attention of health care providers and purchasers, which are described:

- GPs’ concerns over taking responsibility for unfamiliar treatment,
• GPs’ concerns over taking additional responsibility for expensive treatment,
• Consultants’ concerns about prescribing drugs for which there was not budgetary cover,
• Worries faced by patients about the continuity of treatment,
• Hospitals providing insufficient quantities of drugs on discharge or following an outpatient or a casualty visit,
• Additional inconvenience of patients having to obtain prescriptions via their GP.

The 'Purchasing and Prescribing' Executive Letter, issued in autumn 1994 \(^{(204)}\) asked purchasers to develop and agree strategies for improving the cost-effectiveness of prescribing across the primary/secondary interface. Relevant issues addressed were that prescribing included collaboration between primary and secondary professionals and managers to ensure that decision-making considered the patient, drug costs and the circumstances of drug use. The annex listed a number of points to be considered such as ensuring that patients understand their medication, that changes to treatment are communicated effectively and methods of reducing wastage of drugs should be formulated. Much of the content of the executive letter affected hospital pharmacy and has been discussed \(^{(205)}\). The question 'Are changes in patient's therapy communicated adequately across the interface between primary and secondary care?' sets the scene for an improvement in existing arrangements. Similarly, the question 'Do patients understand what their medicines are for and how to take them?' promotes effective routine counselling of patients, although other considerations would
include determining the most appropriate professional to undertake this and the resource implications. Finally, the question 'How can wastage of drugs in any part of the N.H.S. be minimised further?' acknowledges existing deficiencies and potential solutions were discussed earlier.

The Patient's Charter was issued by the government in 1991 and revised in 1995. Citizens were given rights and national and local service guarantees and targets were set. One of the rights given to patients was 'to be prescribed appropriate drugs' and 'to have any proposed treatments, including any risks involved in treatment, and alternatives explained clearly before agreement is made'. An Audit Commission report entitled 'What seems to be the matter: Communication between hospitals and Patient', published in 1993, stated that justification for effective communication includes not just the improvement of a patient's experience of hospital care, but may also improve clinical outcomes, increase efficiency, and strengthen a hospital's market position. It recommended that commissioning authorities should expect that hospital chief executives and general managers find out from patients what information the want, identify groups with particular needs and monitor that patients receive the information intended for them.

A research and development strategy was described in the Department of Health 'Research for Health' paper in 1992, and its objective was to create a research based health service (206). The NHS Central Research and Development Committee proposed broad themes for R&D priorities, which were then refined. One theme concerned research and development at the interface between primary
and secondary care and an advisory group, set up in 1993, reported its findings in 1995\(^{(207)}\). A series of extensive consultations and workshops identified problems which were translated into research needs. As a result, 21 priority areas for research and development were proposed, and the top ten priorities are listed in full:

- Transfer of information across the interface between health care professionals and other agencies.
- Evaluation of clinical guidelines at the interface.
- Appropriate access, use and location of diagnostic facilities and new technologies.
- Impact on referrals and discharge of including patients and carers in decision making.
- Appropriateness of out-patient follow up.
- Evaluation of treatment by referral versus management in primary care.
- Impact of purchasing arrangements on interface.
- Aftercare, rehabilitation and community care for priority groups.
- Prescribing across the interface.
- Models of intermediate care.

Other relevant priorities were the effectiveness of patient discharge procedures, the implications of shorter hospital stays and patients’ and carers’ social needs’.

When application for funding were assessed, out of a total of 674 proposals, 70% were rated by reviewers as insupportable and only 8% ultimately secured funding. Importantly, multidisciplinary applications were more successful in securing funds than applications from one discipline alone, with the odds of successful
application nearly doubling with each increase in the number of disciplines represented (208).

At the time this study was being designed, the NHS Executive Letter EL(94)8 entitled ‘Hospital admission and discharge procedures’ was issued which described admission and discharge procedures as ‘a major quality of service issue and one that demands the attention of local managers’. A workbook for health care workers issued by the Department of Health in 1994 detailed the processes of discharge planning such as pre-admission, referral, admission, assessment of community needs, hospital stay, discharge and follow-up. Although these processes refer to the entire hospitalisation procedure, all are equally applicable to the provision of pharmaceutical services.

Changes within clinical pharmacy and within the NHS have provided an opportunity for pharmacists to identify new measures to achieve seamless care. All interventions can reasonably expect to be evaluated in terms of both benefits and costs since resources within the NHS are finite and the most beneficial intervention may be the most costly. Examination of the available literature has revealed a lack of assessment of both the effectiveness and cost of endeavours designed to promote a seamless provision of pharmaceutical services. Several of the factors described above propelled senior pharmacy management at a London hospital to investigate the level of pharmaceutical input at the primary/secondary interface. The remit of the investigation was to determine the way in which pharmacists could develop systems to improve medication related communication across the interface and any associated benefits and costs. This research aims to
determine whether a pharmaceutical discharge service, the development of which is described in the next section, can reduce errors in medication when medical patients are discharged from hospital and if there are any other benefits and costs associated with providing the service.
CHAPTER TWO. PILOTING THE PHARMACEUTICAL DISCHARGE SERVICE

The previous chapter illustrated problems experienced in the primary/secondary interface in the U.K. and elsewhere. This chapter focuses on local discharge practice at one English hospital and describes how specific problems related to the seamless provision of medication and related information were identified and how a new pharmaceutical service was developed and evaluated.

2.1. Objectives of Pilot Study

To determine the processes in and deficiencies of the existing system for the organisation of discharge medication.

To formulate solutions for problems and implement a new service.

To evaluate the new service to determine whether the solutions are effective.

2.2. Developing the Service At Mount Vernon Hospital

2.2.1. Background

Mount Vernon hospital is a tertiary referral centre for oncology, burns and plastic surgery. In 1994 the hospital also contained acute medical, elderly and surgical beds and a casualty department. At this time, the departments of medicine and pharmacy were concerned about deficiencies within the existing system of organising discharge medication.
The existing local practice within the medical directorate relating to admission and discharge medication was that junior medical staff undertook a drug history as part of the patient clerking interview when patients were admitted into hospital. Ward pharmacists did not formally routinely undertake drug histories. However, where a problem was identified on the drug chart, the pharmacist may have asked the patient to clarify or confirm the prescription, and contacted the hospital doctor or GP where appropriate. On discharge, medication was ordered on a self-carbonating triplicate discharge summary which contained information on discharge drugs in addition to the diagnosis, treatment and any follow-up of the patient. The top copy constituted the discharge prescription which was retained in pharmacy after dispensing and did not include details of diagnosis or treatment.

Once the decision for patient discharge had been made by the medical team, a doctor, usually the house officer, completed the discharge summary by hand. If the discharge summary was picked up by the ward pharmacist on their ward visit, they checked the discharge drug prescription against the drug chart for transcription errors, and brought the top copy of the discharge summary to the pharmacy, with the rest of the discharge summary and the drug chart remaining on the ward. If the discharge summary was sent to the pharmacy by other means, the entire discharge summary and the drug chart were sent and a transcription check was undertaken by the dispensary pharmacist. Hospital policy was to give seven days supply of discharge medication, apart from courses of treatment such as antibiotics or steroids, original containers such as inhalers and creams or hospital only items that were not available in the community. The discharge drugs and
bottom two copies of the discharge summary and the drug chart were sent back to the ward, usually by the pharmacy porter. Prior to discharge the nursing staff gave the discharge medication to the patient. The ward pharmacist did not routinely counsel patients on their discharge medication. Furthermore, patients did not receive any written information regarding their drug therapy, apart from industry produced patient information leaflets if available for the drug or drug information cards such as warfarin or steroid cards. The patient was given a sealed envelope, addressed to their GP, which contained the discharge summary, for delivery to their GP surgery within forty eight hours of discharge. After discharge, the doctor dictated a formal letter to the GP which was typed by a medical secretary and posted to the GP.

2.2.2. Establishing Need for a New System – Problems with Current System

The initial step in designing a new discharge system was to determine the specific problems encountered by health care professionals working within the existing system. This was achieved by conducting face-to-face interviews with hospital and general practice physicians and a senior pharmacy manager. An unstructured interview technique was adopted in order to provide an opportunity for the respondents to give their views and to probe responses. The areas explored were concerns with the existing system for organising discharge medication and related information and identification of any potential for system development. The interview schedule consisted of a simple checklist of topics covered, responses were manually entered onto the interview schedule at the end of the interview which was not tape-recorded.
A consultation was arranged with the clinical director of medicine. The clinical director’s prime concern regarded the issue of junior doctors working hours. He had been requested by the postgraduate dean to take steps to reduce junior doctors hours and he felt that it would be appropriate to achieve this by minimising the amount of time junior doctors spent on ‘clerical’ duties and concentrating on clinical training. He considered that writing discharge prescriptions was time consuming and primarily a clerical rather than a clinical activity for doctors.

Two local general practitioners were contacted at general practice surgeries in Northwood. One of the GPs had previously expressed an interest in developing links with Mount Vernon hospital in terms of discharge planning and was a member of the local GP liaison committee. The GPs’ concerns were, firstly, that GPs perceived that not all discharge summaries were delivered to surgeries by patients. This could be either intentional on the part of the patient if they did not wish the GP to know of their admission, or accidental, such as discharge summaries being lost or misplaced or forgetfulness on the part of the patient. Secondly, the typed discharge letter occasionally did not arrive at the surgery before the prescribing decision was made. Thirdly, the format and content of the information on discharge drugs was criticised. Poor legibility of the information on medication was remarked upon, since a carbon copy of the discharge prescription was sent to the GP and the original top copy retained by the hospital pharmacy. Typed information was preferred over a hand-written list. The information on discharge drugs was in the form of a list, which gave the name of the drug and dose, that was completed by the doctor and a section for the
pharmacy to specify the amount dispensed. Medication that had been stopped by the hospital was not routinely stated on the discharge summary. If the patient did not need a supply of medication as they had sufficient quantities some hospital doctors did not write all the drugs on the discharge prescription, this led to confusion on the part of the GP when reading the discharge summary since it was difficult to differentiate between those drugs that had been intentionally stopped by the hospital and those where a hospital supply was not initiated because the patient had their own. It was claimed that, since most GP practices had the patient’s drug listed on a computer, it would be necessary to go through all of the drugs on the computer list to ascertain whether they had been stopped or continued or the dose changed. The GP would then have to identify all new drugs prescribed by the hospital and add them to the patient’s computer list so that a repeat prescription could be generated. This was felt to be a very time consuming and ultimately costly process as it was often the GP who was responsible for putting this information onto the computer. It was acknowledged that mistakes occurred which resulted in patients receiving out of date repeat prescriptions and consequently differences in medication to that prescribed on discharge.

A senior hospital pharmacy manager who was interviewed perceived that the late ordering of drugs for discharge by doctors resulted in a high number of ‘urgent’ discharge prescriptions and it was proving difficult to effectively manage the pharmacy workload in such a demand led environment. She felt that discharge decisions were often made by the registrar or senior house officer one or two days prior to discharge but that the discharge prescription/discharge summary was not written by the house officer until the days of discharge. This led to the ‘urgent’
requests seen in the pharmacy. Furthermore, it was estimated that the patient’s own medication that they were consuming prior to hospital admission was being brought into hospital by the patient and destroyed by the hospital. This was attributed to the fact that PODs were stored on the ward, and when discharge medication was received by the ward the patient was given the hospital supply and not their own drugs. The patient was discharged and their previous supply sent to the pharmacy, where there was no option other than to dispose of it. If, however, PODs were returned to patients in addition to furnishing them with a hospital supply, there was a potential for confusion, with patients not knowing whether the hospital supply was in addition to or in place of their existing medication. The pharmacy manager reported a case in which a patient who had been discharged from hospital was taking Zyloric ® tablets supplied by his GP and allopurinol tablets supplied by the hospital concurrently and was unaware that they were the same drug. This case highlights problems that may result when the hospital prescribes generically, but the GP prescribes by brand. Refer to Table 1 for a summary of the problems perceived by health care professionals.

2.2.3. Developing A New System.

The local existing system for arranging discharge medication has been described and deficiencies have been highlighted by health care professionals. The next step was to formulate a strategy to resolve some of the problems identified. A systematic problem-solving approach was adopted and potential solutions for each problem were formulated.
Table 1. Summary of problems with existing discharge system relating to medication.

<table>
<thead>
<tr>
<th>Health Care Professional</th>
<th>Problem Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital clinician</td>
<td>Junior doctors working hours are too long.</td>
</tr>
<tr>
<td></td>
<td>Junior doctors are undertaking excess clerical work.</td>
</tr>
<tr>
<td>General practitioner</td>
<td>Lack of receipt of discharge summary</td>
</tr>
<tr>
<td></td>
<td>Lateness of receipt of discharge summary</td>
</tr>
<tr>
<td></td>
<td>Poor legibility of medication on carbon copy</td>
</tr>
<tr>
<td></td>
<td>Insufficient detail on information on discharge medication</td>
</tr>
<tr>
<td>Hospital pharmacist</td>
<td>Urgent requests for discharge medication adversely affecting dispensary workflow.</td>
</tr>
<tr>
<td></td>
<td>Unnecessary destruction of PODs.</td>
</tr>
<tr>
<td></td>
<td>Duplicate supplies of medication causing confusion.</td>
</tr>
</tbody>
</table>
It was recognised that the existing discharge summary served two functions, firstly to order discharge drugs from the hospital pharmacy, and secondly to inform the GP of discharge drugs. The first problem to be addressed was that of discharge prescription writing. Potential solutions were having a pharmacist writing the prescription on the discharge summary which would be countersigned by the doctor before dispensing, increasing pressure on doctors to prescribe discharge medication in sufficient time or completely separating the drug information from other clinical information. The first two solutions still utilised the discharge summary and would not resolve legibility issues nor provide additional information on discharge drugs. The research pharmacist decided to separate the medicines related activity of ordering the discharge drugs and providing the GP with information on discharge drugs from the other clinical information which would continue to be provided by a hospital doctor on the discharge summary. A pharmacist would provide the necessary information to the GP in the form of a discharge medication letter, which would be typed to resolve the problems of legibility (refer to Appendix 1). Three sections of the discharge medication letter were proposed, showing drugs on admission that were continued, drugs on admission that were stopped and new drugs prescribed on discharge. This information would help alleviate GP concerns of the lack of detail on medication changes. Other information was considered for inclusion, such as the reason for stopping medication and the results of drug assays if determined whilst the patient was in hospital. It was decided that the discharge medication letter would contain technical information which would provide the GP with the necessary information to initiate a further supply. Therefore the drug name and dosage instructions were included but reasons for stopping medication was
excluded since this was regarded as clinical information that should be provided by the hospital clinician. The discharge medication letter also contained the patient’s name, address, date of birth and hospital number, and the date of discharge, the ward and the consultant who had been responsible for the care of the patient. This information was selected since it appeared on the discharge summary and would enable the GP to identify the patient concerned.

As well as providing information to the GP on discharge drugs, the drugs section on the discharge summary also ordered the discharge medication from the hospital pharmacy. All medical inpatients had a drug chart which was the record of all medication ordered by the doctor and administered by the nurse. With only a few exceptions, all the drugs that a patient required on discharge were already prescribed on the drug chart. With this in mind, an order form for discharge drugs was designed that was to be attached to the drug chart (refer to Appendix 2). When the patient was planned for discharge this form would be signed by the doctor, after checking to ensure that all appropriate medication was prescribed the drug chart, to request a supply of all regular medication on the inpatient drug chart. The order form included a section for any exceptions or any additional drugs such as ‘as required’ medication. It seemed reasonable to assume that if the list of drugs did not need to be written by the doctor it would take less time for them to order discharge drugs, which in turn should enable the doctor to request discharge drugs as soon as possible after the discharge decision was made.

In order to address concerns about drug wastage, a formal examination of all patients own medication combined with a drug history undertaken by the
pharmacist was necessary. On discharge, any medication that was suitable would be returned to the patient and a hospital supply not issued. Finally, the patient would be counselled on their medication prior to discharge by the pharmacist and an explanation of medication changes given. A patient drug summary (PDS) form was designed to record patient details, drug history, POD information and details of discharge medication dispensed by the pharmacy (refer to Appendix 3).

The discharge medication letter was reviewed and approved by two GPs. The service documentation was reviewed and approved by the pharmacy manager. No approval was sought from the hospital local research and ethics committee since the project was regarded as a service development, which did not require ethical approval. The scheme was given the title ‘pharmaceutical discharge service’.

Refer to Table 2 for a summary of the strategies adopted to resolve problems that were previously identified.

2.2.4. Notification Of Health Care Professionals.

A meeting was held with junior doctors to explain the concept of the pharmaceutical discharge service and their role within the project. Similarly, a presentation was made to the nursing staff on the medical wards and the role of nursing staff was explained. Dispensary and clinical pharmacists were notified in a ward pharmacists meeting.
Table 2. Summary of solutions implemented to resolve problems with existing discharge system relating to medication.

<table>
<thead>
<tr>
<th>Problem Identified</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior doctors working hours are too long.</td>
<td>Not directly resolved.</td>
</tr>
<tr>
<td>Junior doctors are undertaking excess clerical work.</td>
<td>Pharmacist to take responsibility for arranging discharge medication</td>
</tr>
<tr>
<td>Lack of receipt of discharge summary</td>
<td>Not directly resolved.</td>
</tr>
<tr>
<td>Lateness of receipt of discharge summary</td>
<td>Not directly resolved.</td>
</tr>
<tr>
<td>Poor legibility of medication on carbon copy</td>
<td>Typed information to be provided by pharmacist.</td>
</tr>
<tr>
<td>Insufficient detail on information on discharge medication</td>
<td>Medicines discharge letter contains more information on discharge medication</td>
</tr>
<tr>
<td>Urgent requests for discharge medication adversely affecting dispensary workflow.</td>
<td>Pharmacist to take responsibility for arranging discharge medication</td>
</tr>
<tr>
<td>Unnecessary destruction of PODs.</td>
<td>Reissue of PODs, where appropriate.</td>
</tr>
<tr>
<td>Duplicate supplies of medication causing confusion.</td>
<td>Reissue of PODs and patient counselled by pharmacist</td>
</tr>
</tbody>
</table>
Medical and nursing staff in the casualty department were approached and notified of the study with emphasis placed on requesting patients to bring in their medication on admission to hospital. A notice was placed in each cubicle in the casualty department to remind health care professionals to ask patients who are to be transferred to the medical block to bring in their medication. A letter was sent to the secretary of the local medical committee informing them of the study and requesting their support in raising awareness amongst GPs of the need for medical patients to bring in their medication on admission to hospital.

2.3. Pharmaceutical Discharge Service Protocol.

2.3.1. Pharmaceutical Discharge Service Pilot on One Ward.

The Pharmaceutical Discharge Service was piloted on one medical ward to test the documentation and to enable all health care professionals involved to become familiar with their roles and to identify any logistic problems.

Edmunds ward was chosen as the pilot ward. It was a thirty bedded general medical ward and was representative of the three general medical wards in terms of patient turnover and speciality. The research pharmacist had provided a clinical pharmacy service to this ward previously and had built up a working relationship with nursing and ancillary staff and this was also an important consideration. The pilot was undertaken during April 1994 and during the pilot it was perceived by nursing staff that drug charts were off the ward got extended periods of time. Thereafter, the research pharmacist was able to have a transcription check
performed by one of the ward pharmacists on the ward instead of by the dispensary pharmacist in the pharmacy department.

2.3.2. Pharmaceutical Discharge Service Protocol for Admission

All medical admissions were identified by referral to the admissions book or by liaising with the nurse-in-charge, ward clerk or a member of medical staff. The names of all patients, dates of admission and admitting consultant were noted on the medical patient list.

2.3.2.1. Assessment For Drug History Interview

The patient was assessed for suitability for medication history interview after consultation with a member of medical or nursing staff and on the following criteria:

- Linguistic ability – ability to speak and understand English (an interpreter was not available).
- Hearing.
- Mental state (e.g. confusion).
- Physical state (e.g. unconscious, in pain).

Patients who had difficulty in communicating for any of the above reasons were not seen by the pharmacist, but a drug history obtained by secondary means, such as by asking relatives or contacting the GP. The medical notes for all patients
were accessed and demographic details and medical details were recorded on the patient drug summary.

The patients own drugs were retrieved from the nurse-in-charge and the drug history interview undertaken.

2.3.2.2. Drug History Interview

The research pharmacist introduced herself to the patient and requested verbal permission for a drug history interview. Patients were handed their own medication to refer to during the course of the interview and were questioned on current prescribed therapy, current over-the-counter (OTC) medication, current herbal or homeopathic medication, recently discontinued prescribed or OTC medication and known allergies or drug reactions to previous medication, chemicals or food.

All information given was noted in section four of the patient drug summary. After the interview, the time taken for the interview was noted and the patient thanked for their time. The drug chart was referred to and any omissions or errors brought to the attention of the prescribing doctor. The order form for discharge drugs was attached to the drug chart.
2.3.2.3. Checking Patients’ Own Drugs

All PODs brought into the hospital were assessed by the research pharmacist for suitability of extended issue, ie. return to the patient on discharge instead of hospital supply. The following inclusion criteria were applied:

- Drugs dispensed for the patient.
- Drugs in original dispensing container.
- Label legible and instructions correct.
- Contents in good condition on visual inspection.
- Minimum of seven day supply remaining.

The research pharmacist listed the drugs on the PDS form and included the following details:

- Name of preparation.
- Strength and form of preparation.
- Dose instructions on label.
- Number of dose units in container.
- Suitability for extended issue (Y/N).
- Any additional information.

PODs were placed in a property envelope and labelled with the patient’s name and ward. PODs were stored in the pharmacy department in a designated cupboard.
In line with hospital policy, PODs were not used in hospital except in the circumstances detailed below:

- Patients admitted outside pharmacy opening hours may continue to use their own drugs until the pharmacy is open.
- Research and non-formulary drugs brought in by the patient may be continued if agreed or requested by pharmacy.
- Homeopathic medicines.

2.3.3. Pharmaceutical Discharge Service Protocol for Discharge

2.3.3.1 Discharge Medication Planning

The current hospital discharge policy stated that twenty four hours notice was required to dispense discharge medication. Twenty four hours notice was, therefore, also requested for the Pharmaceutical Discharge Service. It was understood that some patients may be discharged at shorter notice and this was acceptable, as long as twenty four hours notice had been given for the majority of patients discharged. For patients who were discharged at very short notice and at weekends the standard discharge system was operated.

When the medical team had made the decision for discharge of a patient, they were prompted by a nurse or the research pharmacist to sign the order form for discharge drugs on the drug chart. As the research pharmacist was based on the ward, she was generally able to discuss the patient’s discharge medication needs with the medical team at the time the discharge decision was being made and
could clarify the discharge medication on the ward. In instances where the research pharmacist was away from the ward, a member of nursing staff prompted the medical team to order the discharge drugs and then informed the research pharmacist who carried a hospital pager. This ensured discharge medication was ordered in sufficient time for any necessary discharge drugs to be dispensed and for the discharge medication letter for the GP to be prepared. Since controlled drugs are subject to specific ordering requirements they could not be ordered in this way and were ordered on the discharge summary by the doctor.

Once the doctor had signed the order form for discharge drugs, the research pharmacist referred to the PDS to establish which patients own drugs could be reissued to the patient and which drugs needed to be dispensed by the hospital pharmacy. Section three of the PDS was completed which listed drugs that required dispensing. In most instances the drug chart, attached order form and the PDS were seen by a ward pharmacist for a transcription check, the drug chart remained on the ward and the PDS was sent to the pharmacy for dispensing of discharge drugs. If a ward pharmacist was unavailable, the drug chart, attached order form and PDS were sent to the pharmacy, where the dispensary pharmacist performed the transcription check and sent the drug chart back to the ward and retained the PDS. The research pharmacist completed the discharge medication letter. Three copies of the discharge medication letter were completed, one for posting to the GP, one retained in the pharmacy department and one for the patient’s hospital medical notes. PODs were retrieved and any medication that was to be continued was placed in the discharge medication bag. Medication that had been stopped was retained in the property envelope.
Discharge medication was stored in a locked designated cupboard on the ward until the patient was to be discharged. The patient was counselled by the pharmacist, and if the patient was to be discharged immediately, they were given the medication. Otherwise the medication was placed in a locked cupboard until the patient was to be discharged.

2.3.3.2. Patient Counselling

A selection of counselling notes were prepared for the pharmacist to refer to prior to counselling a patient. These cards contain information that should be disclosed to patients during the counselling session. The following were counselled upon:

- Name of drug and purpose/indication.
- Frequency and timing of doses.
- Special instructions for administration.
- Precautions.
- Common and rare but significant side-effects.
- Duration of therapy.
- Special storage requirements.
- Obtaining further supplies.
- Disposal of unwanted medication.

After the patient was counselled relevant sections on the nursing discharge form, which was kept with the nursing notes, was completed by the research pharmacist. The section referring to discharge information was completed i.e. whether the
patient was counselled by a pharmacist, and the signature of the pharmacist was required, and the name of the health care professional who gave the patient their discharge medication. In most cases, the research pharmacist gave the patient their discharge medication, although this was not possible in all cases, such as those patients who were planned for discharge at the weekend or after 5pm on weekdays.

Since the hours of the research pharmacist excluded weekends, patients for whom the discharge decision was made after 4pm on weekdays or at the weekend received the standard discharge arrangements. Discharge medication was ordered by the doctor on the standard discharge summary. When the discharge summary was received in pharmacy, the dispensary pharmacist/technician would check the POD cupboard and reissue any suitable PODs. However, reissuing PODs at the weekend proved difficult since discharge medication was ordered on Saturday morning, where a team of only four to five pharmacy personnel were on duty. During this time, there was often a high workload and limited working hours.

2.4. Evaluation of Pharmaceutical Discharge Service

2.4.1. Objectives.

To determine GP satisfaction with Pharmaceutical Discharge Service.

To determine hospital doctor satisfaction with Pharmaceutical Discharge Service.

To determine savings in discharge medication costs associated with Pharmaceutical Discharge Service.
2.4.2. Study Design.

Evaluation of the Pharmaceutical Discharge Service was undertaken as a cohort study, at Mount Vernon Hospital, Middlesex. All medical and elderly patients, admitted to and discharged from the medical and elderly wards in a twelve month period, were eligible. Each medical ward was visited daily, Monday to Friday, by the research pharmacist. All medical admissions were identified, by either referring to the admissions book, or by liaising with the nurse-in-charge, ward clerk, or doctor. The names of all patients, dates of admission, and admitting consultant were noted and all patients who were able to communicate as defined earlier were selected to take part in the study. Data on drug costs were analysed for four months, due to the large study population.

2.4.3. Measures.

Acceptability of the Pharmaceutical Discharge Service to hospital and general practice doctors was determined using a postal, structured, self-administered questionnaire completed anonymously by the respondent. Anonymity was particularly desirable for the hospital doctor questionnaire, since respondents were familiar with the research pharmacist and may have been reluctant to be critical if this was not the case.
Reissue rates of PODs was determined by referring to PDS forms and savings in discharge medication costs estimated by calculation of discharge medication costs from the hospital drugs price list.

2.4.3.1. GP Questionnaire.

Based on initial interviews, GPs concerns about the quality of discharge medication information was related to legibility, delays in receipt and inadequate information. These themes were incorporated into a questionnaire (refer to Appendix 4). Most questions were closed with dichotomous answers, but in some cases were followed by open questions to allow respondents to elaborate on their answers. The questionnaire was limited in size to one side of A4 paper and the dichotomous responses entered into tick boxes to enhance prompt completion. Respondents were thanked at the end of the questionnaire. An initial draft questionnaire and covering letter were discussed with two local GPs and no changes were deemed necessary. General practitioners were selected from the Mount Vernon hospital GP list that detailed 266 GPs in the Northwood area. Questionnaires and covering letters were posted to all GPs on the list who had received at least one discharge medication letter. These GPs accounted for 125 out of the 266 GPs on the list. There was no follow-up of non-respondents.

2.4.3.2. Hospital Doctor Questionnaire

A questionnaire was devised to determine the ease of use of the new system and to estimate any time saved by doctors (refer to Appendix 5). The first two
questionnaires requested the grade of the doctor and the estimated average number of discharge summaries completed in a week. The next two questions referred to the time taken to complete the drugs section of the discharge summary and to estimate the amount of time saved with the new service. The next two questions determined the ease of use of the order form for discharge drugs and any problems encountered with the new system. Opinion of the content of the discharge medication letter was also sought and respondents were asked if there was any additional information they would like to see on the discharge medication letter. Lastly, doctors were asked whether they would prefer to continue using the letter in the future. Tick boxes and a questionnaire length of two sides of A4 paper were chosen to ensure quick completion. Questionnaires were distributed via the hospital internal post system to all medical and elderly care doctors of registrar grade and below in July 1994 and in January 1995. Questionnaires were not sent to consultants since they did not routinely write discharge summaries.

2.4.3.3. Drug Savings/Reissue Rates

Data on discharge drug savings for four months were analysed. Drug costs were calculated from the patient's own drugs that were continued, using the hospital drug price list printed from the pharmacy JAC computer system. Two figures for estimated savings were calculated. Firstly, the savings to the hospital resulting from not having to dispense a supply of drugs that were reissued to patients, and secondly, the value of the drugs that were returned. Reissue rates were calculated by referring to the patient drug summary and determining the number of drugs
taken on admission, those that were brought into hospital and those that were reissued.

2.5. Results

2.5.1. GP Questionnaire.

One hundred and twenty five questionnaires were posted and 61 questionnaires were returned, a response rate of 49%. One questionnaire was returned uncompleted as the GP was no longer at the practice, and another was returned with a note that the topic merited discussion at the GP liaison committee meeting. A further six GPs claimed that they had not received any discharge medication letter and their responses were excluded. Records showed that five of the six GPs had each received one discharge medication letter and the sixth GP had received five discharge medication letters. Final analysis was undertaken for a total of 53 questionnaires (42% of those posted). Refer to Tables 3-5 for summaries of the main findings.

Fifty (94%) respondents described the information supplied by the discharge medication letter as being either ‘useful’ or ‘very useful’. Three (6%) GPs found the information ‘not useful’ (Table 3). Other information that GPs would like to see on the discharge medication letter are detailed in Table 4 and include allergies/ADRs whilst in hospital (41 GPs), and therapeutic drug monitoring results (21 GPs). Thirty eight (71%) GPs considered that they had received the discharge medication letter in sufficient time to review the patient’s medication,
Table 3. GP opinion of usefulness of pharmacy medication letter.

<table>
<thead>
<tr>
<th></th>
<th>No of GPs (n=53)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Useful</td>
<td>32</td>
<td>60%</td>
</tr>
<tr>
<td>Useful</td>
<td>18</td>
<td>34%</td>
</tr>
<tr>
<td>Not Useful</td>
<td>3</td>
<td>6%</td>
</tr>
<tr>
<td>(Not seen</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Other information considered desirable by GPs.

<table>
<thead>
<tr>
<th>Desirable information</th>
<th>No of GPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prompted by questionnaire:</td>
<td></td>
</tr>
<tr>
<td>Allergy/adverse drug reaction history</td>
<td>43</td>
</tr>
<tr>
<td>Therapeutic drug monitoring</td>
<td>23</td>
</tr>
<tr>
<td>Other:</td>
<td>8</td>
</tr>
<tr>
<td>Confirmation of counselling regarding side-effects</td>
<td>1</td>
</tr>
<tr>
<td>Anticipated duration of treatment</td>
<td>2</td>
</tr>
<tr>
<td>List of alternative drug equivalent to formulary drug</td>
<td>1</td>
</tr>
<tr>
<td>Diagnosis</td>
<td>1</td>
</tr>
<tr>
<td>Medication stopped</td>
<td>1</td>
</tr>
<tr>
<td>Blood tests which needs monitoring</td>
<td>1</td>
</tr>
<tr>
<td>Patient information sheets</td>
<td>1</td>
</tr>
<tr>
<td>Monitoring of drug levels if needed</td>
<td>1</td>
</tr>
<tr>
<td>Results of blood tests</td>
<td>1</td>
</tr>
<tr>
<td>Not completed</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 5. GP opinion of timeliness of receipt of discharge summary.

<table>
<thead>
<tr>
<th>Discharge summary received in sufficient time to review patients medication</th>
<th>No of GPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discharge summary NOT received in sufficient time to review patients medication</td>
<td>11</td>
</tr>
<tr>
<td>Other responses ‘not always’, ‘sometimes’</td>
<td>3</td>
</tr>
<tr>
<td>Not completed</td>
<td>7</td>
</tr>
</tbody>
</table>
Table 6. Additional GP comments.

<table>
<thead>
<tr>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Hand-written details are not always legible. Carbon copies are not always legible.'</td>
</tr>
<tr>
<td>'To not have discharge letter sitting around waiting to be coded.'</td>
</tr>
<tr>
<td>'I'm sure it will be vastly superior to that of the houseman.'</td>
</tr>
<tr>
<td>'Sometimes would help to know reason for discontinuing certain medication on admission plus reasons for choosing alternatives.'</td>
</tr>
<tr>
<td>'Should apply for outpatient prescribing too.'</td>
</tr>
<tr>
<td>'What on earth is meant by the word “seamless”?’</td>
</tr>
<tr>
<td>'There have been errors.'</td>
</tr>
<tr>
<td>'It would be preferable if doctor/sister and pharmacy info were all on one sheet of paper.'</td>
</tr>
<tr>
<td>'Excellent, thank you.'</td>
</tr>
<tr>
<td>'Why is co-proxamol used instead of paracetamol.'</td>
</tr>
<tr>
<td>'Marked improvement - well done.'</td>
</tr>
<tr>
<td>'It's a pity someone cannot convey the medical details on the same form!'</td>
</tr>
<tr>
<td>'By its very nature it is not very flexible with PRN medication. Usually this is no problem but I have occasionally had a problem at residential homes where the discharge medication is often dispensed very 'literally'.</td>
</tr>
<tr>
<td>'Too many errors to be able to rely on the letter. If error rate goes down, it will then become useful.'</td>
</tr>
<tr>
<td>'No - except that it is a vast improvement on the previous, often illegible carbon copies.'</td>
</tr>
<tr>
<td>'It is good.'</td>
</tr>
<tr>
<td>'It has improved the accuracy of information coming to us.'</td>
</tr>
</tbody>
</table>
with one GP qualifying it as 'sometimes' (Table 5). Eleven GPs (21%) claimed that they did not receive information in good time, with two GPs qualifying the answer as 'not always'. One GP did not complete this section. Fifty two GPs (85%) answered that they would like to continue to receive discharge medication letters, and only one GP did not wish to receive them. Other comments made by the respondents are listed in Table 6.

2.5.2. Hospital Doctor Questionnaire.

A total of eighteen questionnaires were distributed, nine in July 1994 and nine in January 1995. Sixteen questionnaires were returned, a response rate of 89%. Responses were received from four registrars and twelve house officers.

Doctors were asked to estimate the number of discharge summaries they prepared in one week. The range of discharge summaries written varied from less than one to ten-twenty per week. The mode and median number of discharge summaries written was five-ten. Doctors felt that it took them a median time of between one and five minutes to arrange discharge drugs, and that the Pharmaceutical Discharge Service saved them between one and five minutes per patient. If doctors wrote ten discharge summaries per week, and it is assumed that 2.5 minutes was saved per patient, then 25 minutes per doctor was saved per week, equivalent to three and three quarter hours for the whole medical directorate. However, this time may underestimate the actual time spent by doctors and may not include the time taken to answer queries about discharge medication with the dispensary pharmacist. The number of interventions made by dispensary staff was
not measured, but, subjectively, there was a reduction in the number of interventions once the discharge medication was ordered by the pharmacist.

The order form for discharge medication was found to be very easy or easy to use by thirteen and three doctors respectively, although several problems were identified. Two problems raised were that the order form was not always attached to the drug chart, and that spare order forms were not always readily available. The first problem occurred in general after a drug chart had been rewritten i.e. all drugs prescribed were transcribed onto a new drug chart. If the research pharmacist had not seen the new drug chart she was unable to attach a new order form for discharge medication. These problems were overcome by having a section on the medical notes trolley for order forms. The ward clerk on each ward was given a master and it was their responsibility to ensure that there were spare order forms on the ward. Medical staff were urged to attach the order form to the drug chart if they used the spare forms, the reason being that the drug chart needed to be referred to in order to interpret the instructions and that it was important for the order form not to be misplaced, as may be the case if it was not attached to the drug chart.

Doctors also noted that they often could not find a copy of the discharge medication letter sent to GPs, in the medical notes when they were seeing patients in outpatient clinics after discharge. It was found that the discharge medication letters were being filed with the drug chart rather than with the discharge summary. Subsequently, all letters were stapled to the discharge summary by the
research pharmacist and ward clerks and medical records clerks were requested to
file all letters in the appropriate section of the notes.

Comments were also received on the provision of additional information on the
discharge medication letter. Thirteen doctors requested that any patient
allergies/adverse drug reactions experienced in hospital to be noted on the letter,
and four doctors requested the results of any therapeutic drug monitoring to be
included. This was considered in the early stages of the study, but the remit of the
pharmacist letter to the GP was to provide pharmaceutical information to ensure
continuity of supply of medication to the patient after discharge. It was felt that
documentation of any allergies or adverse events noted in hospital was a clinical
matter and as such should be communicated to the GP by the hospital doctor and
be included on the discharge summary itself. Similarly, the pharmacist sent details
of the medication that was stopped but not the reason why medication was
stopped, as this was considered clinical information which should be
communicated by the hospital doctor on the discharge summary. All doctors
wished to continue using the new system.

2.5.3. Resource Use.

2.5.3.1. Drug Savings

Four months were analysed, May, July and December 1994, and January 1995 and
data for all four months was pooled, with a data for a total of 584 patients. Table 7
shows the value of drugs reissued to patients and the savings to the hospital. A
total of £1502.01 was saved in discharge medication costs for drugs that were
reissued to patient. The value of the drugs returned to patients was £2312.17, a higher figure which was expected since the quantity of drugs reissued may have been greater than the seven day supply on which the hospital saving calculations were based. The two figures relate specifically to drug acquisition costs and do not include container costs or the staff costs associated with dispensing. Since the value of patients own medication was calculated on hospital prices of drugs and many of the drugs were originally issued in the community, the second figure may underestimate the actual value of the drugs.

2.5.3.2. Reissue of PODs

Of the 1537 drugs that the 584 patients were admitted on, 755 or 49% were reissued. Reasons for excluding PODs for reissue were not investigated, but it is noteworthy that around one third of admission drugs were stopped and a high number of new drugs were prescribed. A total of 1444 new drugs were prescribed to patients when they were discharged from hospital, and this nearly doubled the mean number of drugs that patients were taking. This probably reflects the premise that drug therapy is the primary intervention for medical patients.
Table 7. Value of reissued patients’ own drugs’ and hospital savings on drug procurement costs.

(pooled data for four months)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of items reissued</td>
<td>755</td>
</tr>
<tr>
<td>Value of items reissued</td>
<td>£2312.17</td>
</tr>
<tr>
<td>Mean value per patient</td>
<td>£3.96</td>
</tr>
<tr>
<td>Savings to hospital</td>
<td>£1502.01</td>
</tr>
<tr>
<td>Mean saving per patient</td>
<td>£2.57</td>
</tr>
<tr>
<td>Total savings</td>
<td>£3814.18</td>
</tr>
</tbody>
</table>

Table 8. Medication changes made in hospital.

(pooled data for four months)

<table>
<thead>
<tr>
<th></th>
<th>Total n=584</th>
<th>Range</th>
<th>Mean per patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drugs on admission</td>
<td>1537</td>
<td>0 &amp; 14</td>
<td>2.6</td>
</tr>
<tr>
<td>Drugs on discharge</td>
<td>2885</td>
<td>1 &amp; 17</td>
<td>4.9</td>
</tr>
<tr>
<td>Drugs stopped</td>
<td>570</td>
<td>0 &amp; 9</td>
<td>1</td>
</tr>
<tr>
<td>New drugs prescribed</td>
<td>1444</td>
<td>1 &amp; 8</td>
<td>2.4</td>
</tr>
</tbody>
</table>
2.6. Discussion

In this chapter, problems relating to the provision of medicines and medicines related information across the primary/secondary interface at Mount Vernon hospital were described. A new pharmaceutical service that was designed to overcome these problems was implemented and preliminarily evaluated. Table 9 details the original problems, the solutions and outcomes.

The Pharmaceutical Discharge Service reduced the time that hospital doctors spent writing discharge medication, as perceived by doctors who found the service easy to use. The discharge medication letter provided GPs with typed, legible information on discharge medication in greater detail than previously on the discharge summary, and was reported to be useful or very useful by 94% of GPs. Modest savings in drug costs were shown, but dispensary workload was not directly determined. These findings were reported to the Mount Vernon hospital quality management team in 1995 and funding for a pharmacist to provide the service on a permanent basis was secured. A presentation was made to the North Thames regional dispensary managers group by the hospital chief pharmacist who reported the main findings.

The pilot study showed how the new pharmaceutical service was developed and evaluated in terms of doctors’ acceptability and drug savings. An important limitation of the pilot study is that patients were not assessed in any way to determine how the Pharmaceutical Discharge Service affected their medication
taking once they were discharged. Other drawbacks of the scheme were that it was a cohort study, that acceptability to health care professionals was ascertained but there were no measures relating to patient acceptability or relating to whether the service reduced medication related problems experienced by patients after discharge from hospital. In order to address these shortcomings, a randomised controlled trial was designed and is described in the following chapter.

Table 9. Summary of pilot study; problems with existing discharge system relating to medication, solutions that were implemented and evaluated.

<table>
<thead>
<tr>
<th>Problem identified</th>
<th>Resolution</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junior doctors working hours are too long</td>
<td>Not directly resolved</td>
<td>N/A</td>
</tr>
<tr>
<td>Junior doctors undertaking excess clerical work</td>
<td>Pharmacist to arrange discharge medication by transcription</td>
<td>Reduction of time taken to write discharge summary estimated 3.75 hours per week</td>
</tr>
<tr>
<td>Lack of receipt of discharge summary by GP</td>
<td>Not resolved</td>
<td>N/A</td>
</tr>
<tr>
<td>Lateness of receipt of discharge summary by GP</td>
<td>Not resolved</td>
<td>N/A</td>
</tr>
<tr>
<td>Poor legibility of medication information on carbon copy</td>
<td>Typed information provided by pharmacist</td>
<td>Legibility assured</td>
</tr>
<tr>
<td>Insufficiently detailed information on discharge medication</td>
<td>Discharge medicines letter providing additional information</td>
<td>94% of GPs considered information very useful or useful</td>
</tr>
<tr>
<td>Urgent requests for discharge medication adversely affecting dispensary workflow</td>
<td>Pharmacist to be responsible for arranging discharge medication</td>
<td>Not evaluated</td>
</tr>
<tr>
<td>Unnecessary destruction of PODs</td>
<td>Examination and reissue of PODs</td>
<td>PODs valued at £2312 reissued to patients</td>
</tr>
<tr>
<td>Duplicated supplies of medication causing confusion</td>
<td>Patient counseling at discharge and destruction of unwanted PODs</td>
<td>Not evaluated</td>
</tr>
</tbody>
</table>
CHAPTER THREE. DEVELOPMENT OF METHODS FOR RANDOMISED CONTROL TRIAL

3.1. Background

The Pharmaceutical Discharge Service undertaken at Mount Vernon hospital was well received by general practitioners and hospital junior doctors and resulted in some savings in discharge medication costs. The purpose of the service with respect to patients was to reduce errors and confusion relating to medication but this was not ascertained in the pilot study. A randomised control trial (RCT) was necessary to determine whether the service would reduce errors relating to discharge medication compared to the standard system of discharge. The study attempts to determine whether the Pharmaceutical Discharge Service reduces the prevalence and severity of errors in medication when medical patients have been discharged from hospital and to assess where in the primary/secondary interface errors occur. In addition, it is appropriate to determine GPs’ and patients’ views’, and any costs and other benefits of the service. The RCT was undertaken at Watford General hospital, a district general hospital that was part of the same hospital trust and was naïve to the Pharmaceutical Discharge Service. This chapter describes the objectives of the RCT, the methods adopted and their rationale and the development of data collection tools.
3.2. Objectives.

There are four main objective areas, relating to medication discrepancies after discharge from hospital, discharge medication costs and GPs’ and patients’ views regarding discharge medication and related information.

Medication discrepancies:

- To identify discrepancies between discharge medication and subsequent medication in medical patients two weeks after discharge from hospital.
- To determine the prevalence of medication errors in medical patients after discharge from hospital, and whether the pharmaceutical discharge service reduces the prevalence of medication errors.
- To classify the different types of medication errors and whether the pharmaceutical discharge service reduces any specific type of medication error.
- To estimate the severity of medication errors in terms of the potential to cause harm to the patient, and whether the pharmaceutical discharge service reduces the severity of medication errors.
- To determine the prevalence of medication changes made by doctors in medical patients after discharge from hospital and whether the pharmaceutical discharge service reduces the prevalence of medication changes.

Costs:

- To determine drug costs and savings associated with the Pharmaceutical Discharge Service.
• To estimate pharmacy costs of running the Pharmaceutical Discharge Service.

GPs' Views:

• To determine GP opinion of the timeliness, legibility and content of information received on discharge medication.
• To determine GP preference of method of information transfer.

Patients' Views:

• To determine medical patients' opinion of written and verbal information on discharge medication.
• To determine the number of problems with medication identified by patients after discharge from hospital.
• To determine the potential for changes to medication by doctors after patients are discharged from hospital.

3.3. Clarification of Research Questions

3.3.1. Medication Discrepancies.

The study objectives relating to medication discrepancies essentially concern the prevalence of intentional changes to medication by doctors, and the prevalence, type and severity of medication errors in medical patients and whether there is a difference in the prevalence of intended medication changes and in the prevalence, type and severity of medication errors between patients receiving the standard
hospital discharge service and those receiving the Pharmaceutical Discharge Service.

In order to determine the above, it is necessary to define and classify medication errors in the context of the primary/secondary interface. Previous definitions of medication error relate to studies involving the prescribing, supply and administration of drugs within a hospital system, and as such are not necessarily applicable to studies at the primary/secondary interface. Since several studies investigating medication changes following discharge have been published, it is appropriate to review the terminology and definitions adopted by other researchers.

In 1978, Parkin and workers studied medication changes in patients recently discharged from hospital (50). They acquired information from the GP on regimen changes and additional drugs prescribed. They compared the patient's description of medication taken during an interview ten days after discharge with the original discharge prescription and any GP amendments. Two key areas were tested, firstly comprehension, by asking the patient to describe the name and administration details of medication they were taking, and secondly, compliance, by performing a medication dose count. Contacting the GP enabled the investigators to determine whether any differences between discharge medication and medication being taken at home were due to changes initiated by the GP. One criticism of this study related to the fact that patients' preadmission supplies of drugs were not considered during the medication dose count, although the authors reported that patients were taking pre-admission medication. One drawback of the study is that
the interview was conducted ten days after discharge and patients were given a fourteen day supply of discharge medication and may not have obtained further supplies. As a result, the study only investigated the immediate post-discharge phase and no further.

The issue of timing of the home visit to enable discharge medication to be compared to post-discharge supplies has been addressed by other researchers. Burns conducted home visits to elderly patients six to ten days after hospital discharge, and determined additions and omissions by comparing the discharge medication (five days supply issued) with the subsequent prescription issued by the GP (58). They also assessed changes in container labelling and closures, such as non-specific directions and change of closure from non child-resistant to child-resistant. The authors identified additions and deletions but did not ascertain whether changes were made purposefully by the GP. Omori and workers determined three types of error, drug deletion where the patient was not taking a drug that had been prescribed on discharge, drug addition where the patient was taking a drug that had been discontinued by the hospital, and dose error where the dose or schedule of the drug had been changed by the patient since discharge, but they did not contact the GP nor check whether the patient had been in contact with the GP (49). Similarly, Cochrane and workers tested the differences between medication inspected at home visits six to fourteen days after discharge with a five days supply of discharge medication (54). Although the GP was not contacted to determine whether the discharge prescription had been amended for clinical reasons, the authors did note whether the patient had seen their GP after discharge. They included changes in medication name from generic to proprietary, strength,
direction changes where the overall dose remained the same, specific instructions changed to as directed as well as change of dose, drugs stopped or started.

Undertaking two home visits, at one and six weeks after discharge had the advantage of comparing the discharge supply with the pre-admission supply and with the post-discharge supply in another study. In this study, discrepancies were classified as type 1, 2 or 3. A type 1 discrepancy related to discrepancies between the discharge supply and the pre-admission supply as was determined at a domiciliary visit one week after discharge. A type 2 discrepancy related to a discrepancy between the discharge supply and subsequent community pharmacy supplies, determined at a domiciliary visit six weeks after discharge. A type 3 discrepancy was patient associated such as removal of drug from a container. This study provided a more comprehensive evaluation of interface problems although the investigators ascertained discrepancies in medication supplies rather than what the patient did, and did not contact the GP regarding intentional medication changes.

A number of significant points arise from existing studies and warrant clarification. One point is that all of the studies described above made an assumption that the discharge medication prescription was correct. This is necessary to have a point of reference to which subsequent prescriptions or medication are compared to identify disparities. Underlying this assumption is the premise that all medication changes made in hospital are due to conscious clinical decision making. However, it is known that prescribing errors occur in hospital and may be due to inaccurate of incomplete drug histories. Furthermore, since
investigators varied in their definition of errors, and some regarded a change of direction label from ‘8am’ to ‘morning’ as a discrepancy, it is useful to assess the clinical significance of discrepancies. However, in existing studies looking at medication errors across the interface an estimation of the severity of the medication error has been lacking.

Although previous studies have investigated differences in pre-admission, discharge and post-discharge supplies of medication, none have examined the GP records as a potential source of error. Since inaccurate repeat prescriptions may lead to inadvertent continuation of a drug that was discontinued purposefully by the hospital, it appears that a system approach to the classification of errors is warranted. This author notes that the following points require careful consideration:

- Changes made to medication following discharge, may be clinically appropriate.
- Hospital records such as drug histories may be inaccurate.
- Discharge prescription may contain omissions or changes that did not result from clinical decision making.

I propose that the primary/secondary interface should be examined in detail to fully identify and classify medication errors. As can be seen from Figure 3 there are two main communication pathways when patients are admitted into hospital. This pathway is equally appropriate to the outpatient setting. The first of these is communication between the hospital, usually the hospital doctor, and the GP and the second is communication between the hospital, usually hospital doctor or
Figure 3. Communication within inpatient care system (relevant to drug treatment).
nurse, and the patient. On admission the flow of information is from primary to secondary care. When patients are discharged, the communication pathways are similarly, between the hospital and the GP and the hospital and the patient, and information flows from secondary to primary care. In most instances, correspondence between the hospital and the GP is via written or typed communication, such as a referral letter or discharge summary, whereas between the hospital and the patient verbal communication dominates, such as admission drug history acquisition or discharge medication counselling. Following discharge, the patient generally contacts their GP if further supplies of medication are needed.

Breakdowns in communication can occur in these four pathways, on admission, from the patient to the hospital, as in an inaccurate drug history, from the GP to the hospital, an in an incomplete referral letter, and on discharge from the hospital to the patient and from the hospital to the GP. What is of utmost importance is that the patient is taking the medication appropriately, in that they are taking the correct dose of the correct medication at the correct time. A domiciliary visit enables the patient’s drug therapy following discharge to be compared to the discharge therapy. Since patients may have drug changes made by their GP, it is necessary to exclude GP initiated changes to treatment, which can be identified by contacting the GP and requesting this information. After excluding intentional GP changes any difference between the medication (drug, dose, interval) seen at the domiciliary visit and the discharge medication can be due to intentional drug defaulting by the patient, which I have termed non-adherence error, or due to poor comprehension or confusion of medication regimen, which I have termed non-
comprehension error. Patient errors reflect inadequacies in the communication of medicines related information between the hospital and the patient, although there are additional contributory factors for non-adherence errors.

Since the GP receives information from the hospital, it is desirable to determine the effectiveness of hospital to GP communication. This is achieved by requesting the GP to provide details of the patient’s drug therapy after discharge. Breakdowns in communication between the hospital and the GP occur and are acknowledged as system errors. System errors reflect inadequacies in the communication of medicines related information between the hospital and the GP. In order to facilitate terminology, system errors are divided into hospital errors, which occur at the admission point and involve information transfer from primary to secondary care, and GP errors which occur at the discharge point and involve information transfer from secondary to primary care.

Thus each medication discrepancy can be regarded as either an intended medication change by a physician or a medication error. The flowchart in Figure 4 details the discrepancy classification system. For the purpose of this study the following definitions apply:

**Medication Discrepancy**: any difference between prescribed discharge medication and medication seen during the domiciliary visit and/or medicines related information received from the GP. This definition excludes medicines which the patient has purchased (OTC) and medication that was prescribed on a 'when required' basis.
Figure 4. Flowchart to show medication discrepancy classification system.

- Medication Discrepancy
  - Intentional medication change
    - Hospital doctor initiated
    - GP initiated
  - Medication error
    - Patient error
      - Patient non-adherence
      - Patient non-comprehension
    - System error
      - GP error
      - Hospital error
**Intentional Medication Change**: a discrepancy resulting from an intended change to drug treatment by a medical practitioner.

**Medication Error**: a difference in medication or medicines related information which is not intended by a medical practitioner. May be subdivided into patient or system error.

**Patient Error**: an unintended discrepancy in actual medication observed at the home visit (i.e. drug, dose, dosing interval). May be subdivided into non-adherence error or non-comprehension error depending on whether the patient was intentionally defaulting on treatment or was unaware of the correct regimen.

**System Error**: an unintended discrepancy in medicines related information. May be subdivided into hospital or GP error, depending on the location of the error.

### 3.4. Research Questions and Hypotheses.

#### 3.4.1. Medication Discrepancies.

In considering the system described above, certain research questions arise. The first of these is what is the prevalence of medication errors as defined above. Secondly, does the Pharmaceutical Discharge Service reduce the number of medication errors experienced by patients after discharge. Furthermore which, if either, of the two types of medication error are reduced, patient or system errors.
Since this research is investigating communication across the interface, it is particularly interesting to determine whether the Pharmaceutical Discharge Service reduces both the hospital and system types of error. Estimating the likely clinical consequences of medication errors is warranted since previous studies have failed to do this and the reduction of potentially serious errors has implications in the hospital management of risk. From a systems point of view, it is relevant to determine how errors are mediated so that a model of medication errors occurring at the interface may be proposed. In future, alternative interventions can be compared by utilising the same model. It is necessary to determine the prevalence of intentional medication changes by doctors so that these may be excluded and the remaining medication discrepancies classified as medication errors. It would be interesting to see whether the Pharmaceutical Discharge Service affected the prevalence of intentional medication changes by doctors.

A: Prevalence of Medication Error

The fundamental research question is does the Pharmaceutical Discharge Service reduce medication errors across the primary/secondary interface. This question may also be put in terms of whether the Pharmaceutical Discharge Service reduces the number of patients experiencing medication errors. The primary hypotheses are:

Null Hypothesis A1. There is no difference in the number of patients experiencing one or more medication errors between control and intervention groups.
Null Hypothesis A2. There is no difference in the prevalence of medication errors between control and intervention groups.

B: Types of Medication Error

In order to determine where in the system medication errors occur and where the Pharmaceutical Discharge Service reduces such errors, the following secondary hypotheses are tested:

Null Hypotheses concerning patient errors:

Hypothesis B1. There is no difference in the number of patients experiencing one or more patient errors between control and intervention groups.

Hypothesis B2. There is no difference in the prevalence of patient errors between control and intervention groups.

Hypothesis B3. There is no difference in the number of patients experiencing one or more non-adherence errors between control and intervention groups.

Hypothesis B4. There is no difference in the prevalence of non-adherence errors between control and intervention groups.

Hypothesis B5. There is no difference in the number of patients experiencing one or more non-comprehension errors between control and intervention groups.

Hypothesis B6. There is no difference in the prevalence of non-comprehension errors between control and intervention groups.

Null hypotheses regarding system errors:

Hypothesis B7. There is no difference in the number of patients experiencing one or more system errors between control and intervention groups.
Hypothesis B8. There is no difference in the prevalence of system errors between control and intervention groups.

Hypothesis B9. There is no difference in the number of patients experiencing one or more hospital errors between control and intervention groups.

Hypothesis B10. There is no difference in the prevalence of hospital errors between control and intervention groups.

Hypothesis B11. There is no difference in the number of patients experiencing one or more GP errors between control and intervention groups.

Hypothesis B12. There is no difference in the prevalence of GP errors between control and intervention groups.

All of the above hypotheses are to be tested using the Chi-squared test or Fisher exact test for non-parametric data at the p=0.05 level.

C: Medication Error Severity

With regard to the severity of medication errors the following hypothesis was tested:

Hypothesis C. There is no difference in the severity of medication errors between control and intervention groups.

Hypothesis C was tested using the Mann Whitney test at the p=0.05 level of significance.
D: Intentional Medication Changes

With regard to intended medication changes, the following two hypotheses were tested:

Hypothesis D1. There is no difference in the number of patients experiencing one or more intentional medication changes between control and intervention groups.

Hypothesis D2. There is no difference in the prevalence of intentional medication changes errors between control and intervention groups.

The above hypotheses to be tested using chi squared test or the Fisher exact test for non-parametric data at the p=0.05 level of significance.

3.4.2. Associated Costs and Savings.

The feasibility of providing a Pharmaceutical Discharge Service depends to a degree on the costs and savings associated with the service. The potential savings associated with the service are principally due to reuse of patients own drugs. Since previous studies have found wide variations in the sum of money released from using patients drugs, it would be worthwhile to determine exactly how much money was saved in this study. It is necessary to determine what changes are made to patients’ existing medication by the hospital, since this will affect the reissue rate of PODs and also the potential for errors when patients are discharged. Furthermore, it is necessary to ask what pharmacy costs are associated with the service. In terms of costs, the principal cost relates to the availability of
pharmacists to undertake drug histories and discharge counselling and to prepare
discharge medication letters.

### 3.4.3. GP Views.

Null hypotheses

Null hypothesis F1. There is no difference in the time of receipt of the discharge summary between control and intervention groups.

Hypothesis F2. There is no difference in time of receipt of the discharge summary between Aldenham and Heronsgate wards.

Hypothesis F3. There is no difference between GP opinion of legibility of the discharge summary between control and intervention groups.

Hypothesis F4. There is no difference between GP opinion of completeness of the information regarding discharge medication in the discharge summary between control and intervention groups.

Hypothesis F5. There is no difference between GP preference of vector between control and intervention groups.

Hypothesis F6. There is no difference between GP preference of vector between Aldenham and Heronsgate wards.

### 3.4.4. Patients views.

It is appropriate to determine the patient’s opinion of discharge medication and related information. Firstly, do patients feel that they receive sufficient verbal and
written information on discharge medication. Importantly, how useful do they find any written information that has been provided, since it is not worthwhile producing written information if the patient does not utilise it. It is useful to determine whether the patient has experienced any medication problems since discharge and whether they had any outstanding questions on discharge medication. Finally, it is necessary to determine whether the Pharmaceutical Discharge Service reduces problems that patients have identified and questions that they had about their discharge medication.

Null hypothesis G1. There is no difference in the number of patients with problems with medication after discharge between control and intervention groups.

Null hypothesis G2. There is no difference in the number of patients with outstanding questions relating to discharge medication between control and intervention groups.

3.5. Study Design.

3.5.1. Study Rationale.

A randomised controlled trial was undertaken at Watford general hospital during June to November 1996. Randomisation was necessary to ensure that there was no allocation bias, and a table of random numbers was used to allocate patients into either the intervention or control arm of the study. A control group was included so that the new service could be compared to the existing discharge practice.
There was no blinding of either patients or investigator. Ideally, if the patient cannot be blinded, then the investigator should be blinded to minimise bias. However, it was not possible to blind the investigator for practical reasons and this is recognised as a potential limitation.

The overall study design is displayed in Figure 5 and required eligible patients to be randomised into control or intervention groups when they were admitted onto the medical wards. Intervention group patients were recruited and consented at this point and received the pharmaceutical discharge service as the intervention whereas control patients were recruited on discharge. There was no physical separation of intervention and control patients, who may be in the same ward bays. Control patients were in a position to observe discussions between the intervention patient and the research pharmacist. If the control patients were recruited on admission, they may subsequently give thought to their medication and take the opportunity to discuss medication problems with the research pharmacist or the hospital pharmacist. On discharge, a domiciliary visit was arranged with the patient and the GP opinion questionnaire eliciting GP opinion of the quality medication related information posted to the GP. Domiciliary visits were undertaken three weeks after discharge and patients were interviewed utilising the home visit interview schedule. At this point, the home visit questionnaire was posted to GPs requesting information on the patient’s drug therapy and whether any changes to discharge medication had been made. Interviews were conducted after three weeks to enable patients to exhaust their hospital supply and receive a further supply of medication.
Figure 5. Study Design

Admission → Randomisation

Intervention (pharmacy discharge scheme)
Written Consent Obtained

Control (standard discharge)

Discharge

Discharge Questionnaire
sent to GP

Written Consent obtained
Discharge questionnaire
sent to GP

Post Discharge

Patient Interview
Home visit questionnaire
sent to GP

Patient Interview
Home visit questionnaire
sent to GP

Pharmacy discharge scheme: Pharmacist acquired drug history and examination of PODs on admission, and medication letter to GP and patient counselling on discharge.

Standard discharge practice: Doctor acquired drug history. No formal examination of PODs. Discharge summary to GP completed by doctor. No formal patient counselling on discharge.
3.5.2. Patient and Ward Inclusion Criteria.

3.5.2.1. Patient Selection Criteria

Recruitment of patients depends on specific criteria being fulfilled on admission and on discharge. Therefore the inclusion criteria for patient selection have been separated into admission and discharge requirements. The following admission criteria applied to patient selection:

- Resident within Hertfordshire.
- General medical patient.
- Able to communicate in English (patients who were unconscious or confused were excluded. Patients not able to speak English were excluded, unless a translator was found who was present during consent, medication history interview, discharge counselling and domiciliary visit).
- No known history of violence, drug/alcohol abuse or psychiatric disorder (excluding depression).
- Prescribed one or more regular drugs on admission.
- Written consent obtained for intervention patient.
- Transferred from MAU/CCU within 48 hours of admission.

The admission exclusion criteria were:

- Living in a nursing home or otherwise not responsible for own medication.
- Patient previously randomised or recruited.
- Terminal care patient.
- Transferred from MAU/CCU over 48 hours after admission.
• Transferred from another ward or another hospital.

Patients residing outside Hertfordshire were excluded due to the logistic difficulty in undertaking home visits over a long distance. Furthermore, Watford general hospital data on admissions revealed that 93.8% of discharged from the medical unit from July to December 1996 resided in Hertfordshire (personal communication with Information Technology department, Watford general hospital).

The following discharge inclusion criteria applied to patient selection:

• Prescribed one or more long-term medication on discharge.
• Discharged to own home.
• Written consent obtained for control patients.

The following exclusion criteria applied on discharge:

• Transferred to another ward or another hospital.
• Discharged to nursing home or other establishment where the patient is not responsible for administration of own medication.
• Discharged at weekend.

3.5.2.2. Ward Selection Criteria

As the service was developed on medical wards at Mount Vernon hospital, the two general medical wards at Watford General hospital, namely Aldenham and Heronsgate wards, were selected as the study wards. Each ward operated slightly
different discharge procedures in that on one ward the discharge summary was given to the patient to take to their GP, and on the other ward the discharge summary was posted to the GP. The Medical Assessment Unit, an eighteen bedded unit, acted as a buffer between the casualty department, GP referral and the wards. The aim was to admit patients, either from casualty or directly referred from the GP, onto this unit for assessment. Patients were expected to remain on the unit for a maximum period of 48 hours, and were then either transferred to the medical or elderly care wards or were discharged home. Admissions included haematology patients who came in for blood transfusions and were then discharged. Transfers to the medical wards accounted for only 45 of the 197 admissions to MAU during a 4 week period, it was decided that patient selection would not take place on MAU since the majority of patients were either discharged home or transferred to the elderly care wards.

The coronary care unit (CCU) was not strictly part of the medical directorate but part of the intensive care unit, and had a total of five beds. Since it was felt that patients admitted to CCU would be critically ill it would be difficult to obtain consent and a drug history. Therefore the CCU was not used to select patients.

3.5.3. Intervention.

The intervention in the RCT is the Pharmaceutical Discharge Service. The service protocol is described in detail in section 2.3. The protocol used in the pilot study was adopted with changes in the storage and assessment of PODs and in the provision of written information to the patient. These changes were that PODs
were stored in a locked cupboard on the ward in a patient property envelope as specified in the hospital drugs policy. There were designated cupboards on the medical wards for PODs and discharge medication, but no storage facilities existed in the pharmacy department. Keys to the PODs/discharge medication cupboard were held by the nurse-in-charge of the ward for each shift and the research pharmacist held a duplicate set of keys. There was also a difference in the assessment of PODs. Since Watford general hospital supplied two weeks supply of discharge medication, a minimum of fourteen days supply of PODs was required. Finally, all patients were given a patient reminder chart (refer to Appendix 6) which contained the names and dosage instructions of discharge medication.

Control patients received the standard discharge service, where the medication history and preparation of discharge prescription were undertaken solely by the doctor and patients were counselled on their medication by a nurse. The system was similar to that practiced at Mount Vernon hospital, although a different type of discharge summary was used at Watford General hospital (refer to Appendix 7). At Watford general hospital, the top copy of the discharge summary was sent to the GP, the middle copy was retained in the hospital medical notes and the bottom copy was retained in the hospital pharmacy department.

3.6. Ethical Approval

Since the study involved patient recruitment, ethical approval was necessary. A presentation was made to the Mount Vernon and Watford Hospitals NHS Trust
local research ethics committee in April 1996. A research protocol was sent in advancement of the meeting to be distributed to committee members. Following the presentation approval was given, pending certain minor amendments to be made to the documentation. Refer to Appendix 8 for a copy of the final research protocol submitted to the ethics committee. The committee felt that a lone female researcher undertaking home visits may pose risks for the researcher. It was agreed that patients would be visited in the hours of daylight and the researcher would have a mobile telephone. The pharmacy department at Watford general hospital were to be informed of the home visit when the researcher left the department and were notified when the researcher had returned. The importance of the need to obtain written consent and confidentiality of all data, including that stored on computer disk was also stressed by the committee. The standard hospital consent form was used (refer to Appendix 9) and a patient information sheet was designed to give to the patient at the beginning of the study (refer to Appendix 10).

The researcher also sought ethical approval from West Hertfordshire Community NHS Trust local research ethics committee, since studies examining patients in the community were required to submit for approval to the community trust. Ethical approval from West Hertfordshire Community NHS Trust was given in April 1996. The local medical committee was informed of the research in a document which was sent to the secretary and contained an overview of the study.

The major data collection tools were the patient interview schedule and the two GP questionnaires, the GP opinion questionnaire and the home visit questionnaire. There were three phases of data collection tool development, firstly, initial development of the patient interview schedule and GP questionnaires, secondly a first pre-test and subsequent amendments and thirdly a second pre-test and final amendments.

3.7.1. Initial development of Patient Interview Schedule and GP Questionnaires

One of the purposes of the domiciliary visit was to identify what medicines related information the patient had received and if they had experienced any medicines related problems. It was appropriate to determine the patient’s medication habits, such as whether they required assistance with medication, as this may identify any unintended differences between the two groups. In order to examine whether any prescribing had taken place after the patient had been discharged, the schedule included questions on whether the patient had been in contact with a hospital or their GP. The patient’s drug history was required to find out if there were any medication discrepancies and this was determined by direct questioning and the actual medication was requested for examination.

A draft patient interview schedule was developed which included sections on the patient’s demographic details, patient recall of discharge medication provision and
of questions or problems relating to discharge medication, and contact with
doctors after discharge, in addition to a section for noting the current drug history.
The draft schedule was sent for discussion to two research pharmacists who had
experience in undertaking patient interviews. Comments received included advice
on layout and format and rewording of two questions that were ambiguous.

Two questionnaires to be completed by general practitioners and a covering letter
were developed. One questionnaire, referred to as the GP opinion questionnaire,
sought GP views of the quality of medication related information that they
received when the patient was discharged from hospital, and the other, referred to
as the home visit questionnaire, sought a post-discharge drug history from the GP
and requested the GP to specify any medication changes that had been made. The
purpose of the GP opinion questionnaire was to:

- Determine timely receipt of the discharge summary.
- Determine whether, in the GP’s opinion, any delay in receipt of the
discharge summary resulted in an inability to initiate a further supply of
medication.
- Determine the GP’s opinion of the legibility and completeness of the
discharge correspondence.
- Determine the GP preference for the method of sending the discharge
summary and determine any differences in the time to receive the
discharge summary when two methods were employed.

The GP questionnaires and covering letter were shown to five general
practitioners and four practice managers in the Watford area. These persons were
selected purposefully since their practices covered Watford and the surrounding area. All GPs and practice managers were firstly telephoned and notified of the study. A meeting was requested with all nine individuals and was arranged in six cases. Three GPs were too busy for a personal visit and were posted the questionnaires and telephoned two weeks later for their comments. GPs and practice managers were asked firstly to explain the way in which discharge summaries were utilised in their surgery, secondly for their comments on the questionnaires and thirdly, for their comments on the study, as described below.

3.7.1.1. GP Systems for Discharge Summary Utilisation

All GP surgeries had a computerised system for issuing prescriptions. One GP admitted as being unsure how the hospital discharge system operated. Only one GP practice had a GP who wrote his own prescriptions, although the rest of the surgery was ‘paperless’ and held computer patient records.

There was no standard system for dealing with discharge summaries in the GP surgeries contacted. In some cases, the GPs questioned saw all discharge forms themselves and entered all relevant data onto the practice computer. This was reflected by a practice manager who confirmed that all discharge summaries in that practice were sent to the GP who had the responsibility for putting all data onto the computer. The surgery then awaited the patient to request the repeat prescription from, in most cases, the receptionist. However, in another practice, when a discharge summary was received, it was initially seen by the GP and then placed in the patient’s notes by the secretarial staff. When the patient made an
appointment to see their GP, the GP would refer to the discharge summary during the consultation. One GP practice was prospective in that the discharge summary was reviewed by the doctor soon after it was received, and information highlighted by the GP. This information was then entered onto the computer by the receptionist and the discharge summary was filed. This was perceived by the practice manager as being quite a speedy operation with results entered within 24 hours and letter within 48 hours of receipt. The general trend was for discharge summaries to be placed in the patient’s notes by the receptionist or secretary and then referred to by the GP when the patient presented for a consultation. Any changes in medication was either added onto the computer record by the GP or by the receptionist.

3.7.1.2. Comments on Questionnaire Design

The two GP questionnaires and covering letter were discussed with practice managers and GPs. The GP opinion questionnaire was designed to determine the level of GP satisfaction with information received on drug therapy when the patient was discharged from hospital. It was sent to the GP in the same envelope as the discharge information, and was accompanied by a covering letter explaining the purpose of the study. The following comments were made:

- Best to tell the GP the purpose of the study on the actual questionnaire- e.g. striving to improve service.
- Ask politely –e.g. please could you take two minutes to answer the questions.
• The researcher would need to know which document the GP is referring to when completing the questionnaire i.e. the discharge summary or discharge medication letter.

• There needs to be very simple instructions for the return of completed questionnaires, i.e. where and how to return them.

• One GP commented that if there was just one delay in completing the questionnaire they will bin it!

• For the home visit questionnaire, it may be advantageous to telephone the GP prior to sending it.

• The questionnaires seem to be quite involved, not sure whether GPs will complete them.

• GP opinion questionnaire should not be a problem, as GP has all necessary data to hand.

• May need to highlight that quality of information on medication being requested, as may get comments on quality of entire discharge summary and not just the drugs data that is required.

• The GP will need the notes to answer the home visit questionnaire and this may reduce response rate.

3.7.1.3. Comments on Study

One of the practice managers who had been visited by the research pharmacist subsequently discussed the study at the surgery practice meeting. As a result, the doctors decided not to participate in the study due to lack of time. The practice manager therefore could not guarantee that the questionnaires would be completed.
by doctors, although the practice manager herself would try to provide any information requested. Finally, it was commented by several general practitioners that many studies are conducted where the GP respondents have no feedback, and that it may be a good idea to report back to GPs at the end of the study.

3.7.2. First Pre-Test of Patient Interview Schedule.

The purpose of the pre-test was to test the meaning of the questions, test the task difficulty and to determine the respondent interest and attention. The pre-test consisted of open interview with patients attending medical out-patient clinics at Mount Vernon hospital. Medical consultants were approached and permission requested to interview patients while they were waiting for their outpatient consultation. Permission was given by three of the four medical consultants, the fourth being on holiday. An outpatient list was requested from the outpatient department which contained names and details of patients attending the medical outpatient clinic on a specific day and whether patients had been discharged from hospital or had been referred by their GP. A list of patients who had been discharged from hospital approximately two weeks earlier and who were contactable by telephone was compiled. The patient’s medical notes were retrieved from the medical records department and patient details such as admission and discharge dates, diagnosis and discharge drugs were noted. Patients were telephone the day before or the morning of their clinic appointment, and asked if they could take part in a project that would involve a pharmacist asking them some questions about their medication. It was explained that the interview would only take ten to twenty minutes while they were waiting to see the doctor,
and that if the doctor was ready the interview would be terminated so that they could see the doctor. They were also requested to bring in their medication. The sister in charge of the clinic was consulted to inform her of the arrangements and to request a room in which to undertake interviews.

On the day of the clinic, the nurse in charge of the outpatient clinic was given a list of patients and informed the pharmacist when the patient arrived at the clinic. When the patient arrived, the research pharmacist introduced herself and once again requested permission to ask some questions about their medication. If the patient consented, they were taken into a private consulting room. Prior to commencing the interview, patients were told that it was a ‘practice run’ and there were no right or wrong answers. During the interview, patients were asked to explain their answers and to inform the pharmacist if they found the questions difficult to answer or understand. Only a few key questions from the interview schedule were asked each patient so that the answers given could be probed.

Five patients were seen originally and as a result some questions were reworded in plainer English. A further five patients were then interviewed using the reformatted questionnaire and no further amendments were required.

3.7.3. Second Pre-test of Patient Interview Schedule and GP Questionnaires.

For the second pre-test, the entire process was tested, and as such it was necessary to obtain written consent from the patient before discharge, to post the GP opinion
questionnaire with the discharge summary, undertake the domiciliary visit and post the home visit questionnaire at the time of the domiciliary visit.

Five patients who were about to be discharged and fulfilled the study criteria were selected from the study medical ward, Aldenham and Herongate, at Watford general hospital. Written consent was sought from patients and a date arranged for the patient to be visited at home. All patients were visited and four out of five patients' GPs' returned both questionnaires. One GP did not return either questionnaire.

Following this pre-test, the patient interview schedule was reformatted in order to provide adequate space for the patient's responses, but the questions were not altered in any way (refer to Appendix 11). The GP questionnaires seemed to provide the correct information and the response rate was sufficiently high to require no change (refer to Appendices 12 & 13).

3.8. Calculation of Sample Size

A previous study had found a discrepancy rate of 90% in elderly patients (54). For this study the following parameters are assumed, a reduction in discrepancies from 80% to 50% with a power of 90% and alpha = 0.05 assuming a dropout rate of 10% (209). A total of one hundred and twenty patients needed to be recruited in order to fulfil the statistical requirements.
3.9. Notification of Health Care Professionals.

All key hospital staff were informed of the study. Both verbal and written information was supplied to medical, nursing and pharmacy staff as described below. Information sheets for pharmacy, nursing staff and doctors were designed and handed out to the appropriate professionals during training sessions. See Appendices 14-16 for samples of the information sheets.

All medical consultants were met individually and a presentation made detailing the general aims of the study. Support had already been granted by the medical director when applying for ethical approval. A presentation to junior medical staff (i.e. registrar, senior house officer and house officer grades) was made in May 1996 at the junior doctors forum. All medical and elderly care sisters were informed of the study during a presentation given in April 1996 at a senior ward managers meeting. A presentation was made to pharmacy staff (pharmacists and technicians) during a dispensary meeting in May 1996. Presentations to all hospital staff were well received and many staff were positive about the study.

3.10. Timetable for Recruitment.

The patient data collection phase was scheduled to cover a six month period. During this period, it was necessary to recruit one hundred and twenty patients as determined by the sample size calculations. Since it was logistically impossible to recruit patients in hospital and undertake home visits at the same time, specific weeks were allocated for recruitment and follow up. The six month data collection
period was divided into four blocks, of six weeks each (refer to Appendix 17 for timetable). The first two weeks of each block were devoted to selection and recruitment of patients on the wards, the next two weeks for inpatient stay and discharge, and the final two weeks for home visits. In each block, thirty patients needed to be recruited in order to fulfil the sample size. In order to account for potential refusals and transfers it was felt that forty patients should be recruited in each block, and randomly allocated into control or intervention groups.

Time was allocated to complete the three main activities, recruitment, discharge and domiciliary visits. From data obtained at Mount Vernon hospital, one hour per intervention group patient was allocated for each admission work and discharge work. Thirty minutes was allocated to control group patients for recruitment. For the domiciliary visit, two hours per patient was allocated, which included travelling time. All patient specific documentation was stored in a locked cupboard in the dispensary manager’s office, the key held only by the research pharmacist. Patient recruitment started on 3rd June 1996. The medical wards and CCU and MAU were visited by the research pharmacist each morning, Monday to Friday inclusive.

3.11. RCT Protocol.

3.11.1. Identification and Recruitment of Patients.

All patients admitted in the previous 24 hours were noted on the patient admission record (PAR). On Monday, all patients admitted during the weekend were also
documented. The ward clerk was contacted in the first instance, then nursing staff were approached to identify admissions. In the first week of data collection, the hospital casualty department was also visited. The casualty record book contained details of all patients seen in the casualty department and their outcome, i.e. discharged, transferred to other ward etc. This book was consulted on the first week and tallied with the data on patient admissions collected on the wards. Thereafter, patient admission were identified solely on the wards concerned.

For patients admitted onto Aldenham and Heronsgate wards, the research pharmacist referred to the patient’s medical notes and entered the date, patient name, ward, date of admission, address and consultant in the appropriate columns of the PAR. For those patients meeting the inclusion criteria, a number was assigned. Once all eligible patients were assigned numbers, they were randomly allocated into the intervention or control group using a table of random numbers.

### 3.11.2. Obtaining Consent

The research pharmacist informed nursing staff of the patients who were selected. Consent for control patients was sought prior to discharge and for intervention patients on admission. The research pharmacist approached the patient, identified and introduced herself and delivered a standard statement, of which the main points are given:

- Request permission to talk to the patient.
- State main purpose of study, that is undertaking a project on medicines that patients get when they leave hospital.
• (For intervention patients only) This would involve speaking to the patient on existing medication, examining PODs and counselling the patient on discharge medication.

• A home visit, approximately three weeks after discharge to see how the patient coped with their medication.

• The patient is not obliged to take part and if they refuse, they will receive the usual hospital care.

• The patient may change their mind at any point and will receive the usual hospital care.

All patients were given a copy of the patient information sheet and thanked for their time. A return visit was made, usually the same day, to see if the patient had decided to enter the study. During this second visit, the research pharmacist went through the patient information sheet, gave the patient opportunity to ask any questions and asked if the patient agreed to participate in the study. If the patient consented, a nurse, preferably the named nurse, was asked to act as a witness. The name of the study and the patient’s name and address was entered onto the consent form and the patient signed and dated the form, and the nurse signed as the witness. The research pharmacist also signed the consent form. Two copies of the signed consent form were made, one was placed in the patient’s medical notes and the other was given to the patient. The original consent form was retained by the research pharmacist. The researcher explained to all intervention patients that she would be conducting a drug history interview and asked if the patient’s own medication could be seen as part of the interview. If the medication was at home, arrangements were made to have it brought into hospital if possible. A trial
identification sticker was attached to the drug chart of intervention patients. The intervention patients received the Pharmaceutical Discharge Service.

3.11.3. Discharge.

The research pharmacist was bleeped when an intervention or control patient was to be discharged. Control patients were recruited on discharge and consent was obtained at this stage. The admission drug history for control patients was noted from the medical notes at this point. The data and time of the home visit, to be conducted three weeks later, was arranged with the patient. The patient received a home visit sheet and were informed that they would be telephoned the day prior to the visit to confirm whether they still wished to participate and that the data was convenient. The patient was reminded that they were free to change their mind and withdraw from the study at any time.

The GP opinion questionnaire for the GP, the covering letter and a postage-paid reply envelope were placed in the discharge envelope with the discharge summary by the research pharmacist. If the discharge summary had not been completed, the questionnaire, covering letter and reply envelope were given to the ward clerk for inclusion in the discharge summary envelope.

3.11.4. Domiciliary Visit.

The patient was telephone the day before the domiciliary visit, and were reminded of the interview and were asked to confirm whether the interview time, date and
venue were convenient. If the patient did not have a telephone, a postal reminder was sent five days prior to the interview.

An interview timetable was compiled for each week and a copy given to the dispensary services manager. The timetable contained the names and addresses, and telephone number if applicable, of patients to be visited, and the date and time of visits. The mobile telephone number of the research pharmacist was also recorded. In addition, the research pharmacist informed the dispensary manager when she left the department to undertake the visits. One the patient interview was concluded the research pharmacist informed the dispensary manager, either directly or via the telephone. The second GP questionnaire, the home visit questionnaire and a postage-paid reply envelope were posted two days prior to the home visit.

The home visit was undertaken three weeks after discharge. The purpose of the visit was to identify current drug therapy and to determine patient opinion of information provided on discharge and any medicines related problems experienced by patients. The research pharmacist conducted the interview in accordance with guidelines in the patient interview schedule. The time taken for the interview was noted at the close of the interview and the patient thanked for their help.

At the end of each recruitment block, all GP opinion and home visit questionnaires were checked, and non-responders were sent a further copy of the appropriate questionnaire, together with a letter which informed the GP of the
study and requested their support in completing and returning the questionnaire. After a further two weeks, for all patients for whom a home visit had been undertaken and the home visit questionnaire had not been returned, a telephone follow-up was made to determine the patient’s current drug therapy and whether any changes to discharge medication had been made. The discharge questionnaire was not followed up via telephone due to the perceived difficulty in obtaining all the relevant documents and the reliance on the GP’s memory.


All medication discrepancies were tabulated and classified according to a flowchart devised by the research pharmacist (refer to Appendix 18). The flowchart was designed and refined as a result of discussion on the definition and classification of medication discrepancies with two other researchers. All Chi-squared and Fisher exact tests were undertaken by hand.

Medication errors occurring within hospitals have been extensively researched. In order to differentiate errors into those that may harm the patient and those that have little effect, a number of methods, mostly developed in USA, for determining the severity of medication errors have been described. One method for grading the severity of errors that has been validated and is reliable and practical utilises at least four judges to score medication errors using a visual analogue scale \(^{(210)}\). This method was used to determine the estimated severity of medication errors found in
this study. A brief description of errors was distributed to three clinical pharmacists and one doctor. They were asked to rate each error in terms of its potential clinical significance by marking on a scale running from zero to ten. A score of zero indicates an incident with no effects on the patient and a score of ten indicates an incident that would result in death. The mean scores for each error was calculated and the Mann-Whitney test employed to determine any difference in mean severity score of medication errors between intervention and control patients. It is

3.12.2. Costs Analysis

The two objectives of the RCT relating to costs were to determine the drug costs and savings associated with the Pharmaceutical Discharge Service and the pharmacy costs of providing the service.

Discharge medication costs were determined using the dispensing program held in the pharmacy computer ASCribe system which were accessed by the computer services manager. The dispensing program records the patient hospital number for each drug dispensed. A list of patients, the corresponding hospital number and the date of dispensing were used to obtain details of all drugs dispensed and their costs for all study patients.

The following parameters relating to drug costs were measured:

For all patients:

- The name and number of drugs on admission to hospital.
• The name and number of drugs stopped by the hospital.

• The name and number of new drugs started by the hospital.

• The name and number of existing drugs for which dose changes were made.

• The name and number of drugs supplied as discharge medication by the hospital pharmacy and the cost.

For intervention patients only:

• The number of patients own drugs brought into hospital.

• The number of drugs returned to patients on discharge and the estimated costs.

• The estimated cost savings for the hospital resulting from reissuing PODs.

The number and quantity of drugs returned to intervention patients was determined by referring to the patient drug summary (PDS). For all drugs that were reissued to patients, an estimation of the cost price was made using the hospital cost price catalogue for drugs which gives the actual cost price for drugs purchased under contract and which applied for the financial year 1996-1997. For drugs that were not listed in the hospital catalogue, the Drug Tariff April 1996 (Department of Health, HMSO) was referred to. Using the hospital catalogue price may underestimate the actual value of drugs reissued. For all PODs that were reissued to patients, the cost savings to the hospital were determined by working out the number of dose units required for fourteen days supply and the cost of this supply calculated from the hospital cost price catalogue for drugs.
The cost of providing the Pharmaceutical Discharge Service is dependant upon a number of factors. By far the most important is the time commitment required. Hence, the running costs of the service are primarily the time required to undertake the drug history interview and check the PODs, and the time to arrange the discharge medication, complete the discharge medication letter to the GP and counsel the patient. Other costs such as training costs and computer costs are one off costs or are staff costs to other departments, such as training of doctors and nurses. Reuse of PODs may realise savings in terms of a reduction in dispensary workload. In the study, the times measured were the time required to undertake the drug history and check the PODs and the time required to counsel the patient on discharge. The time commitment required can be translated into the amount of time required to provide the service to each medical patient. The total staff cost will depend upon the grade of pharmacist required and the turnover of medical patients.

3.12.3. GPs’ and Patients’ Views.

The GP opinions of information received on discharge medication was ascertained in the GP questionnaire. Patient opinion of written and verbal information on discharge medication was determined during the domiciliary visit. All data obtained from the patient interview schedule was manually entered onto a coding frame and then transcribing the coded data onto SpSS software. Data from the GP opinion questionnaire was analysed manually.
It is acknowledged that the tool for derivation of severity scores relating to medication discrepancies was adapted from a system developed for the scoring of medication administration errors occurring in acute hospital settings, and this system has not been validated for medication discrepancies occurring at the interface between primary and secondary care. At the time of the study, there were no validated systems for scoring the severity of medication discrepancies occurring at the interface. Furthermore, limitations of design of the GP opinion questionnaire (requesting GP opinion on the quality of the discharge medicines information received) are acknowledged. The information obtained by direct questioning is termed a primary source data, and secondary sources such as medical records, or in this instance, the discharge summary and pharmacy medicines letters could have been examined to obtain the desired information which was the quality of the medicines related information on the discharge summary versus the pharmacy medicines letter.
CHAPTER FOUR. RESULTS.

The results and analyses are divided into five sections, and sections two to five relate to the four main objective areas, medication discrepancies, costs, GPs views, and patients views, as stated earlier.

4.1. Patient Recruitment.

4.1.1 Study Population.

During the six month recruitment period, there were 855 admissions to the medical wards at Watford general hospital. Four hundred and forty three patients (52%) were admitted to the study wards. The remaining 412 patients were admitted to either coronary care unit (CCU) or the medical assessment unit (MAU). Figure 6 summarises the entire patient recruitment process.

Of the 443 patients admitted to the study wards, 241 (54%) fulfilled the admission inclusion criteria for patient selection. The remaining 202 patients who did not meet the admission criteria were excluded at this stage. Refer to Table 10 for the reasons for exclusion. The largest group not meeting the admission criteria were patients residing outside Hertfordshire; this accounted for 45 patients, over one fifth of patients excluded at this stage. This may be explained by the distribution of local hospitals. Watford general hospital, in Hertfordshire, and Mount Vernon hospital, in Middlesex, form one NHS hospital trust. Watford general hospital provides an acute accident and emergency service, whereas Mount Vernon
Figure 6: Patient Recruitment Chart

- Number of patients admitted to medical wards: 855
- Number admitted to study wards: 443
- Number admitted to CCU/MAU: 412
- Number fulfilling entry criteria: 241 (123 intervention, 118 control)
- Number not fulfilling entry criteria: 202 (for reasons see table 10)
- Number recruited: 88 (45 intervention, 43 control)
- Number not recruited: 153 (for reasons see table 11)
- Number of home visits: 78 (40 intervention, 38 control)
- Number of home visits not undertaken: 10 (for reasons see table 12)
- Number of GP questionnaires returned: 71 (including one with no data as patient had died)
- Number of complete data: 70 (37 intervention, 33 control)
Table 10. Summary of reasons for patients not fulfilling entry criteria.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident outside Hertfordshire</td>
<td>45</td>
<td>22.3</td>
</tr>
<tr>
<td>No prescribed drugs on admission</td>
<td>20</td>
<td>9.9</td>
</tr>
<tr>
<td>Transfer to another ward</td>
<td>16</td>
<td>7.9</td>
</tr>
<tr>
<td>Psychiatric history</td>
<td>14</td>
<td>6.9</td>
</tr>
<tr>
<td>Transferred from CCU</td>
<td>14</td>
<td>6.9</td>
</tr>
<tr>
<td>Transferred from MAU</td>
<td>10</td>
<td>5.0</td>
</tr>
<tr>
<td>Resident of nursing home</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>Terminal care patient died</td>
<td>9</td>
<td>4.5</td>
</tr>
<tr>
<td>Transfer to/from another hospital</td>
<td>8</td>
<td>4.0</td>
</tr>
<tr>
<td>Unable to speak English</td>
<td>7</td>
<td>3.5</td>
</tr>
<tr>
<td>Surgical patient</td>
<td>6</td>
<td>3.0</td>
</tr>
<tr>
<td>Not randomised – other</td>
<td>6</td>
<td>3.0</td>
</tr>
<tr>
<td>Transferred from ITU</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Care of elderly patient</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Not responsible for own meds</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Unable to communicate/confused</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Discharged at short notice</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Previous patient</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>Discharged at weekend</td>
<td>4</td>
<td>2.0</td>
</tr>
<tr>
<td>Transferred from Aldenham Ward</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Discharged on antibiotics only</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>No fixed abode</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Ambulatory care project</td>
<td>1</td>
<td>0.5</td>
</tr>
<tr>
<td>Totals</td>
<td>202</td>
<td>100%</td>
</tr>
</tbody>
</table>
hospital does not have accident and emergency facilities. Therefore, patients residing in Middlesex who required acute medical intervention were treated at Watford general hospital, yet did not meet the inclusion criteria. The second largest exclusion group, accounting for 29 patients (14%), were transfers from MAU or CCU. Patients admitted from either of these wards were only considered for inclusion in the study if they had been in the units for 24 hours or less.

4.1.2. Patients Satisfying Inclusion Criteria.

Two hundred and forty one patients fulfilled the admission criteria to enter the study and were randomised on admission to hospital (Intervention-129; Control-118) although only 88 patients (36%) were ultimately recruited since recruitment was dependant upon certain criteria be satisfied on discharge. The remaining 153 patients (I-78;C-75), who were randomised but not ultimately recruited, did not meet the discharge criteria and the reasons are documented in Table 11.

The largest group were patients who had not been discharged (I-16;C-23), accounting for 26% of cases. This was expected as in order to rationalise the recruitment process it was necessary to recruit over a limited period of time. Hence patients with an extended stay were excluded. This fact was recognised during study design but hospital figures had indicated that the average length of stay was five days. Twenty nine patients (I-25;C-4), accounting for 19% of dropouts at this stage, were randomised but refused consent. This difference in refusal rates may be attributed to the difference in timing of consent.
Table 11. Summary of reasons for non-recruitment of suitable patients.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Intervention</th>
<th>Control</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not discharged</td>
<td>16</td>
<td>23</td>
<td>39</td>
<td>26</td>
</tr>
<tr>
<td>Consent refused</td>
<td>25</td>
<td>4</td>
<td>29</td>
<td>19</td>
</tr>
<tr>
<td>Unknown</td>
<td>8</td>
<td>16</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>Discharged before consented</td>
<td>8</td>
<td>10</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Discharged while pharmacist absent</td>
<td>4</td>
<td>6</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Transferred to another ward</td>
<td>5</td>
<td>5</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Discharged on no drugs</td>
<td>3</td>
<td>6</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Transferred to another hospital</td>
<td>3</td>
<td>3</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Confused</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>RIP</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>TTAs ordered old way</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Referred to psychiatrist</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
<td>75</td>
<td>153</td>
<td></td>
</tr>
</tbody>
</table>

Table 12. Summary of reasons for not undertaking home visit.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Intervention</th>
<th>Control</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refused consent</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Re-admitted</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Lost to follow-up</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Not responsible for own medication</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>
Intervention patients were recruited on admission as a drug history was required. However, control patients were recruited prior to discharge.

Twenty four patients, 16% of dropouts at this stage, were lost to follow-up. This was due to transfers of patients to other wards/departments and patients who self-discharge, and this data was held in the ward book which should be updated by ward clerical and nursing staff. It proved difficult to keep track of all patients, and there were occasional omissions in the ward book which resulted in the loss of patients from the study.

Eighteen patient (12%) were discharged before being consented. These patients were often only on the medical wards for less than twenty four hours. It proved difficult to consent, perform a drug history and arrange all discharge medication for patients who had been in hospital for such a short period of time, and so these patients were also excluded due to study design. A small proportion of patients (11%) were transferred to other wards or hospitals. Only ten patients (7%) were discharged during the pharmacist’s absence, which implies that for the majority of patients the discharge decision is made during the normal working hours of 9am to 5pm, Monday to Friday. Patients who were discharged after 5pm and at weekends were included in the study if the decision for discharge was made while the research pharmacist was available. All arrangements were made during working hours, and medication was left on the ward to be given to the patient prior to discharge.
4.1.3. Patients Recruited Into Study.

Figure 6 summarises the details of the final recruitment stage. A total of 88 patients were ultimately recruited on discharge (I-45; C-43). Seventy eight of these patients were then visited at home. Reasons for not undertaking the home visit are given in Table 12. Six patients subsequently refused the home visit and two patients were readmitted into hospital. The readmissions were not followed up. One patient had supplied an incorrect address and telephone details and was unable to be contacted, and the remaining patient was no longer taking responsibility for their medication and was under the supervision of the district nurse for all her nursing and medication needs. Furthermore, one patient was visited at home but subsequently excluded from the study due to the long interval between discharge and the domiciliary visit.

Interpretation of the appropriateness of medication taken at the home visit relied upon receipt of the home visit questionnaire posted to general practitioners. Of the 78 questionnaires sent to determine drug history, 71 were returned, a response rate of 91%. One questionnaire contained no information as the patient had subsequently died. The remaining 70 questionnaires were completed correctly, and a final figure of 70 patients was obtained for whom complete data set was available and analysis of medication errors could be undertaken.
4.2. Medication Discrepancies.

As defined previously, medication discrepancies were classified into two mutually exclusive groups, either intentional changes to medication made by hospital or primary care doctors or medication errors. Within this section, four main results will be presented, and hypotheses A to D will be tested. Firstly, the prevalence of medication errors between intervention and control groups will be compared. Secondly, analysis will be undertaken on the type of medication errors observed in order to determine any difference between the two groups, and thirdly, the severity of medication errors will be determined and medication errors will be briefly described. Finally, the prevalence of intentional changes to medication will be determined and intentional changes will be briefly described. Five hundred and twenty two drugs were examined in total during the study. These were collated by including drugs on admission to hospital, drugs on discharge from hospital, drugs seen during the home visit and the drug history at the GP practice as identified by the home visit questionnaire.

4.2.1. Prevalence of Medication Errors.

Medication errors have been fully defined earlier, and can be regarded as any change in medication or medication records held by the GP or hospital which were not made intentionally by a clinician. Medication errors are divided into two types, patient errors and system error. The prevalence of medication errors was determined by comparing the medication histories obtained from the patient and the GP at the time of the home visit with the hospital admission and discharge
drug histories. Analysis was undertaken in respect to the prevalence of medication errors and the number of patients experiencing medication errors. Every drug prescribed is associated with an opportunity for medication error, and since a total of 522 drugs were prescribed, the denominator for prevalence of medication errors is 522. Figure 7 details the prevalence and type of medication errors in the intervention and control groups.

Overall medication errors occurred in 31% of patients (I-4;C-18), but involved only 10% of drugs (I-7;C-47). In the control group, 55% of patients experienced one or more medication errors compared with 11% of intervention patients, and this difference is significant (I=4, C=18, chi squared value=13.5, df=1, p=0.001). The null hypothesis A1 that there is no difference in the number of patients experiencing medication errors is rejected and the alternative hypothesis that the Pharmaceutical Discharge Service reduces the number of patients experiencing medication errors is accepted. In terms of the prevalence of medication errors, of the 54 drugs associated with medication errors, there were more medication errors in the control group than in the intervention group and this difference is significant (I=7, C=47, chi squared value=33.112, df=1, p=0.001). The null hypothesis A2 that there is no difference in the prevalence of medication errors between control and intervention groups is rejected and the alternative hypothesis that the Pharmaceutical Discharge Service reduces the prevalence of medication errors is accepted.
Figure 7. Flowchart showing the prevalence and type of medication errors in intervention (I) and control (C) groups of patients (significance level \( p=0.05 \)).

Total No. of Drugs Examined = 522
(I=266, C=256)
Total No. of Patients = 70
(I=37, C=33)

Medication Error
54 drugs (I=7, C=47, hyp \( \chi^2 = 33.12, p=0.001 \)) in
22 patients (I=4, C=18, hyp \( \chi^2 = 13.5, p=0.001 \))

No Medication Error
468 drugs (I=259, C=209) in
48 patients (I=33, C=15)

Patient Error
18 drugs (I=3, C=15, hyp \( \chi^2 = 7.41, p=0.01 \)) in
12 patients (I=2, C=10, hyp \( \chi^2 = 5.96, p=0.02 \))

Non-adherence
11 drugs (I=3, C=8, hyp \( \chi^2 = 1.64, p=0.2 \)) in
7 patients (I=2, C=5, hyp \( \chi^2 = 0.37 \))

Non-comprehension
7 drugs (I=0, C=7, hyp \( \chi^2 = 7.86 \), Fisher exact, \( n/a \)) in
5 patients (I=0, C=5, hyp \( \chi^2 = 0.02 \))

System Error
36 drugs (I=4, C=32, hyp \( \chi^2 = 22.88, p=0.001 \)) in
16 patients (I=3, C=13, hyp \( \chi^2 = 6.31, p=0.02 \))

GP Error
22 drugs (I=2, C=20, hyp \( \chi^2 = 14.41, p=0.001 \)) in
10 patients (I=2, C=8, hyp \( \chi^2 = 3.63, p=0.1 \))

Hospital Error
14 drugs (I=2, C=12, hyp \( \chi^2 = 6.31, p=0.02 \)) in
10 patients (I=1, C=9, hyp \( \chi^2 = 6.71, p=0.01 \))
4.2.2. *Types of Medication Error.*

Analysis of types of medication error determines whether the Pharmaceutical Discharge Service reduces system and patient errors and to identify if non-adherence errors, non-comprehension errors, GP errors or hospital errors are reduced. Two aspects were analysed, the number of patient experiencing the different types of medication error and the number of drugs associated with the different types of medication error.

4.2.2.1. **Patient Errors**

Patient errors occurred in 17% of all patients ($I=2$, $C=10$, chi squared value=5.96, $df=1$, $p=0.02$, hypothesis B1), and accounted for 18 errors ($I=3$, $C=15$, chi squared value=7.41, $df=1$, $p=0.01$, hypothesis B2), with some patients experiencing more than one error. The null hypothesis B1 that there is no difference between the number of patients experiencing patient errors is rejected in favour of the alternative hypothesis that the Pharmaceutical Discharge Service reduces the number of patients experiencing patient errors is accepted. Furthermore, the null hypothesis B2 that there is no difference in the prevalence of patient errors between the two groups is rejected and the alternative hypothesis that the Pharmaceutical Discharge Service reduces the prevalence of patient errors is accepted.

Patient errors were subdivided into non-adherence and non-comprehension errors. Non-adherence errors were experienced by 10% of all patients ($I=2$, $C=5$, Fisher test, $p=0.37$, hypothesis B3), and involved 11 drugs ($I=3$, $C=8$, Chi squared
value=1.64, df=1, p=0.2, hypothesis B4). The null hypothesis B3 that there is no difference in the number of patients experiencing non-adherence errors and the null hypothesis B4 that there is no difference in the prevalence of non-adherence errors between control and intervention patients are accepted. It was hoped that patient counselling by the pharmacist would reduce non-adherence types of medication errors, but this was not observed.

No intervention patient experienced non-comprehension errors, which occurred in five control patients and involved seven drugs. The null hypothesis B5 that there is no difference in the number of patients experiencing non-comprehension errors between the two groups is rejected in favour of the alternative hypothesis (I=0, C=5, Fisher exact test, p=0.02). The Fisher exact test calculation for the null hypothesis B6 was inconclusive, in that the computer was unable to perform the calculation due to the large sample size, therefore this hypothesis cannot be upheld or rejected (I=0, C=7, Fisher exact test = n/a).

4.2.2.2 System Errors

System errors occurred in 23% of all patients (I=3, C=13, chi squared value=7.99, df=1, p=0.01, hypothesis B7), and involved 36 drugs (I=4, C=32, chi squared value=22.88, p=0.001, hypothesis B8). The null hypothesis B7 that there is no difference in the number of patients experiencing system errors is rejected in favour of the alternative hypothesis. The null hypothesis B8 that there is no difference in the prevalence of system errors between the two groups is rejected in favour of the alternative hypothesis.
System errors were subdivided into hospital or GP errors depending on where the error occurred. Hospital errors occurred in 14 drugs (l=2, C=12, chi squared value=6.31, df=1, p=0.02, hypothesis B10) and involved 10 patients (l=1, C=9, chi squared value=6.71, df=1, p=0.01, hypothesis B9). The null hypotheses B9 and B10 that there is no difference in the prevalence of hospital errors and in the number of patients experiencing hospital errors are rejected and the alternative hypotheses that the Pharmaceutical Discharge Service reduces the prevalence of hospital errors and the number of patients experiencing hospital errors is accepted.

GP errors occurred in 22 drugs (l=2, C=22, chi squared value=14.41, df=1, p=0.001, hypothesis B12) and involved 10 patients (l=2, C=8, chi squared value=3.63, df=1, p=0.1, hypothesis B11). The null hypothesis B12 that there is no difference in the prevalence of GP errors between the control and intervention groups is rejected and the alternative hypothesis that the Pharmaceutical Discharge Service reduces GP errors is accepted. The null hypothesis B11 that there is no difference in the number of patients experiencing GP errors between the two groups is upheld. It is thought that poor communication between health care professionals across the interface contributes to system errors. The Pharmaceutical Discharge Service attempted to reduce system errors by improving the mechanism for medication information transfer at both the admission and discharge stages.
4.2.3. Description of Medication Errors.

Drugs that were implicated in medication errors were categorised into BNF class, and are detailed in Table 13. As can be seen from the table, cardiac drugs accounted for the largest category, and were implicated in nearly one third of medication errors. General medical patients were recruited and since the diagnosis for each admission was not recorded, it is not possible to determine whether there were a large number of cardiology patients or whether cardiology drugs are specifically associated with errors. Nearly one quarter of all medication errors involved respiratory drugs, and 16% involved central nervous system drugs. Of eighteen drugs that were involved in patient errors, eleven were due to non-adherence and seven were due to non-comprehension. Six of the non-adherence errors involved respiratory drugs, two involved ulcer healing drugs, and there was one case each involving an analgesic, an antidepressant, and an antiplatelet drug. Of the seven patients, two patients had two and four non-adherence errors each and the other five patients had one non-adherence errors each. Of the two intervention patients, one patient with chronic obstructive airways disease had reduced the doses of his terbutaline and ipratropium nebulers from four times a day to twice a day. The other intervention patient had been taking cimetidine when required instead of twice a day. In the control group, one patient had reduced the doses of salbutamol and beclomethasone inhalers from four times a day to twice a day, and had stopped using the terbutaline and ipratropium nebulers that had been prescribed four times a day on discharge. Another control patient had increased his ranitidine dose from twice daily to three times a day. In one case, the husband of a 73 year old control patient had stopped giving her fluoxetine capsules as she
Table 13. BNF Category of Drugs associated with medication errors.

<table>
<thead>
<tr>
<th>BNF Category</th>
<th>Drug</th>
<th>Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.0 Gastro-intestinal System</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Antacids</td>
<td>Gaviscon</td>
<td>1</td>
</tr>
<tr>
<td>1.3 Ulcer-healing drugs</td>
<td>Cimetidine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ranitidine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Omeprazole</td>
<td>1</td>
</tr>
<tr>
<td>1.6 Laxatives</td>
<td>Co-danthrusate</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ispaghula husk</td>
<td>1</td>
</tr>
<tr>
<td><strong>2.0 Cardiovascular system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.2 Diuretics</td>
<td>Bendrofluazide</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Amiloride</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Co-amilozide</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Frusemide</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Burinex A</td>
<td>1</td>
</tr>
<tr>
<td>2.4 Beta-adrenoreceptor blocking drugs</td>
<td>Sotalol</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Atenolol</td>
<td>1</td>
</tr>
<tr>
<td>2.5 Drugs affecting the renin-angiotensin system</td>
<td>Lisinopril</td>
<td>1</td>
</tr>
<tr>
<td>2.8 Anticoagulants</td>
<td>Warfarin</td>
<td>3</td>
</tr>
<tr>
<td>2.9 Anti-platelet drugs</td>
<td>Aspirin</td>
<td>5</td>
</tr>
<tr>
<td><strong>3.0 Respiratory system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Bronchodilators</td>
<td>Salbutamol</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Terbutaline</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ipratropium</td>
<td>3</td>
</tr>
<tr>
<td>3.2 Corticosteroids</td>
<td>Beclomethasone</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Budesonide</td>
<td>2</td>
</tr>
<tr>
<td><strong>4.0 Central Nervous system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 Hypnotics and anxiolytics</td>
<td>Temazepam</td>
<td>1</td>
</tr>
<tr>
<td>4.3 Antidepressants</td>
<td>Fluoxetine</td>
<td>1</td>
</tr>
<tr>
<td>4.7 Analgesics</td>
<td>Co-proxamol</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Co-codamol</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Dihydrocodeine</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Meptazinol</td>
<td>1</td>
</tr>
<tr>
<td><strong>6.0 Endocrine system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3 Corticosteroids</td>
<td>Prednisolone</td>
<td>2</td>
</tr>
<tr>
<td><strong>9.0 Nutrition and blood</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1 Anaemias</td>
<td>Ferrous</td>
<td>1</td>
</tr>
<tr>
<td><strong>10.0 Musculoskeletal and joint diseases</strong></td>
<td>Ibuprofen</td>
<td>1</td>
</tr>
<tr>
<td>10.1 Drugs used in rheumatic diseases and gout</td>
<td>Diclofenac</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Athrotec ®</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Azathioprine</td>
<td>1</td>
</tr>
</tbody>
</table>
had become unsteady. One control patient who had been in hospital after an admission for chest pain had her preadmission dose of aspirin increased from 75mg daily to 150mg daily on discharge, but was taking 75mg again at home.

Non-comprehension errors occurred in five control patients, accounting for seven errors and did not occur in intervention groups. One patient had stopped taking her ferrous sulphate tablets after the hospital supply had run out as she thought that she only had to take it for two weeks. Similarly, one patient had stopped her aspirin and bendrofluazide that had been newly started by the hospital after the hospital supply had been finished and was unaware of the need to continue her treatment which was initiated after a diagnosis of hypertension and stroke had been made in hospital. One patient had restarted a terbutaline inhaler which had been stopped by the hospital as well as continuing to take the salbutamol inhaler prescribed by the hospital. The reason why the terbutaline inhaler was changed to salbuamol inhaler is not known. In one patient, the dose of bendrofluazide had been reduced by the hospital, but the patient was taking the original dose, as listed in the GP’s medication list. The GP did not admit to reducing the dose intentionally. Also, in this patient the dose of atenolol was 25mg, whereas they were discharged on 50mg. The GP stated they had not altered the therapy, although the dose on the GP records was 25mg. Another patient was also taking the preadmission dose of bendrofluazide and the GP records showed the preadmission dose whereas the dose had been halved by the hospital. These errors are difficult to classify, since the dose changes made by the hospital may have been unintentional, and the pre-admission dose may in fact be the ‘true’ dose. This will be explored further in the discussion.
The system errors occurring in the intervention group were attributable to the hospital in one patient (two drug cases), and to the GP in two patients (two drug cases). The hospital error occurred in a patient who had been prescribed a beclomethasone inhaler on discharge from hospital, but had stopped it and restarted a budesonide inhaler that he had been using prior to hospital admission. The hospital error occurred in a patient who had been prescribed a beclomethasone inhaler on discharge from hospital, but had stopped it and restarted a budesonide inhaler that he had been using prior to hospital admission. The drug history undertaken by the research pharmacist had noted beclomethasone as the steroid inhaler that the patient had been using, although the actual inhaler was not available for inspection. This discrepancy highlights the point that the availability of all pre-admission drugs is necessary to effectively undertake a drug history. In one of the patients who had experienced a GP error, the hospital had stopped amiloride tablets and the patient had complied. However, the GP records still showed the drug on the patient’s drug record. This patient had three drugs stopped by the hospital, two of which were not on the GP records, and a new drug started by the hospital which was listed on the GP records. Furthermore, the dose of frusemide had been increased by the hospital and the new dose was listed on the GP records. It seems strange that four changes to the medication list were made, but one was not. It is not known whether the GP had intentionally left the amiloride on the list. However, it is known that the patient did not request a supply of the amiloride. Informing the patient of their medication changes enables the patient to continue the correct regime, despite inaccuracies in the GP records. In the other patient who experienced a GP error, aspirin had been stopped by the hospital and warfarin initiated, but both drugs appeared on the GP records. The prescription for aspirin had not been requested by the patient. In the control group, the system errors allocated to the hospital involved twelve drug
cases, and those allocated to the GP involved twenty drug cases, and occurred in nine and eight patients respectively. All of the twelve hospital errors were related to incomplete drug histories on admission, implicating the following drugs: salbutamol inhaler, beclomethasone inhaler, beclomethasone nasal spray, temazepam (two cases), co-danthrusate, bumetanide A, co-codamol, fybogel, gaviscon, dihydrocodeine and ibuprofen. All drugs were completely omitted from the drug history, with the exception of beclomethasone inhaler for which a strength of 50mcg had been supplied when the patient normally used a 200mcg strength inhaler. In all cases, the patient continued the medication, which were also listed on the GP records. The GP errors implicated twenty drugs. For three drugs (steroids in two cases, sotalol) the dose in the GP records differed to that in the hospital records and that which the patient was taking. Omission from the GP record of drugs that the patient was discharged on occurred in ten drugs (co-codamol, warfarin [two cases], co-proxamol, aspirin, frusemide, lisinopril, salbutamol, ipratropium, prednisolone). In the remaining nine cases, the GP record listed drugs that the patient was not taking and that the hospital was not aware of (azathioprine, methotrexate, co-proxamol, indomethacin, diclofenac, co-amilozide, aspirin, omeprazole, Arthrotec). These errors occurred in ten patients. In many instances, existing drugs were stopped when new drugs were started, for example, co-proxamol and aspirin stopped and warfarin started. There is a potential for patients to request prescriptions of drugs that have been stopped for clinical reasons, in addition to continuing the hospital discharge drugs which may lead to drug toxicity or adverse effects.
GP errors highlight the need for prompt updating of GP records to prevent patients restarting preadmission drugs and doses. Many of the errors involved preadmission drugs and it may be difficult for a GP, when reading a discharge summary, to quickly determine the changes to medication that have been made by the hospital. Finally, two patients stopped taking three drugs simply because they were unaware of the need to continue therapy and obtain a further supply. It is necessary to tell patients the estimated duration of the medication and how to get further supplies.

4.2.4. Severity of Medication Errors.

Figures 8 and 9 display the mean severity scores for medication errors in the control and intervention groups respectively. The median of the mean severity scores was 3 (interquartile range 2-3, range 2-5) for the intervention group and 3 (interquartile range 2-6, range 1-8) for the control group.

There was no significant difference between intervention and control group mean error severity scores (using the Mann-Whitney U test, correction applied for tied values, \( U=1199.5, z=0.909, n1=7, n2=47, p=0.1611, \) hypothesis C). The null hypothesis that there is no difference in the severity of medication errors between intervention and control group is upheld.
Figure 8. Frequency of mean severity scores for control group

[Bar chart showing frequency distribution of mean severity scores for control group]
Figure 9: Frequency of mean severity scores for intervention group
4.2.5. Intentional Medication Changes

The prevalence of intentional changes to medication by doctors was determined by directly questioning patients on any contact with their GP or hospital doctors, reviewing medication at the domiciliary visit and requesting information directly from the GP. Refer to Figure 10 for a summary of the intentional changes made to medication by doctors.

Overall, 30% of patients experienced intentional changes to medication by primary and secondary physicians. Intentional changes to medication were identified for 33 drugs (I=17;C=16) in 21 patients (I=9;C=12). These intentional changes to medication are subdivided into those made by general practitioners and those made by hospital doctors. General practitioners were responsible for 94% of intentional medication changes, which involved 31 drugs (I=17;C=14) in 19 patients (I=9;C=10) whereas hospital doctors were responsible for changes in two drugs (I=0;C=2) in two patients (I=0;C=2). There was no difference in the total number of intentional medication changes made by clinicians in the two groups (I=17;C=16, chi squared value=0.291, df=1, p=ns, hypothesis D2) and the null hypothesis D2 that there is no difference in the prevalence of intentional medication changes between control and intervention groups is upheld. Furthermore, there was no difference in the number of patients experiencing intentional medication changes between the two groups, (I=9;C=12, chi squared value=0.614, df=1, p=ns, hypothesis D1) and the null hypothesis D1 that there is no difference in the number of patients experiencing intentional medication changes between control and intervention groups is upheld.
Figure 10. Flowchart of the intentional changes to medication by doctors.

Total No. of Drugs Examined = 522
Total No. of Patients=70
Intended changes in 33 drugs (I=17, C=16, hypothesis D2, p=ns)
in 21 patients (I=9, C=12, hypothesis D1, p=ns)

GP Initiated
31 drugs (I=17, C=14) in
19 patients (I=9, C=10)

Hospital doctor initiated
2 drugs (I=0, C=2) in
2 patients (I=0, C=2)

Control group drugs
New drug 7
Dose change 3
Dosage form change 1
Stop drug 2
Stop, then restart drug 1

Intervention group drugs
New drug 7
Dose change 5
Dosage form change 1
Stop drug 4

Control group drugs
New drug 1

Dose change 1

Intervention group drugs
Nil

167
In the intervention group, changes initiated by the GP accounted for seventeen drug cases. The changes are further categorised to a change in dose (five drugs), a change in dosage form (one drug), starting a new drug (seven drugs), and stopping a drug (four drugs). In the control group, fourteen drug changes were initiated by the GP, namely, starting a new drug (seven drugs), change in dose (three drugs), stopping a drug (two drugs), change in dosage form (one drug), and stopping then restarting a drug (one drug). Table 14 details the BNF class of drugs that were associated with intentional changes.

Intentional changes to medication by doctors occurred in 30% of all patients. This indicates that interaction between the patient and clinicians can occur within a short period of time after discharge and result to changes in drug therapy. Appropriate medication changes occur rapidly after discharge from hospitals when patients attend outpatient clinics, visit casualty departments or see their GPs for a variety of reasons. This contact with clinicians adds to and updates the information on discharge medication. These consultations provide complex information on medication and it may prove difficult to form a comprehensive medication list, as medication is constantly changing.
Table 14. BNF class of drug changes initiated intentionally.

<table>
<thead>
<tr>
<th>BNF Category</th>
<th>Drug</th>
<th>incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 Gastro-intestinal System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1 Antacids</td>
<td>Mucaïne</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Asilone</td>
<td>1</td>
</tr>
<tr>
<td>1.2 Antispasmodics</td>
<td>Mebeverine</td>
<td>1</td>
</tr>
<tr>
<td>1.6 Laxatives</td>
<td>Lactulose</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Senna</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Co-danthrusate</td>
<td>1</td>
</tr>
<tr>
<td>2.0 Cardiovascular system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.1 Positive inotropic drugs</td>
<td>Digoxin</td>
<td>1</td>
</tr>
<tr>
<td>2.2 Diuretics</td>
<td>Frusemide</td>
<td>3</td>
</tr>
<tr>
<td>2.4 Beta-adrenoreceptor blocking drugs</td>
<td>Atenolol</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sotalol</td>
<td>1</td>
</tr>
<tr>
<td>2.5 Drugs affecting the renin-angiotensin</td>
<td>Captopril</td>
<td>1</td>
</tr>
<tr>
<td>2.6 Nitrates, calcium-channel blockers and</td>
<td>Glyceryl trinitrate</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Isosorbide</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Nicorandil</td>
<td>1</td>
</tr>
<tr>
<td>2.9 Anti-platelet drugs</td>
<td>Aspirin</td>
<td>1</td>
</tr>
<tr>
<td>3.0 Respiratory system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1 Bronchodilators</td>
<td>Terbutaline</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ipratropium</td>
<td>1</td>
</tr>
<tr>
<td>3.2 Corticosteroids</td>
<td>Beclomethasone</td>
<td>1</td>
</tr>
<tr>
<td>4.0 Central Nervous system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1 Hypnotics and anxiolytics</td>
<td>Temazepam</td>
<td>1</td>
</tr>
<tr>
<td>4.6 Drugs used in nausea and vertigo</td>
<td>Prochlorperazine</td>
<td>1</td>
</tr>
<tr>
<td>4.7 Analgesics</td>
<td>Paracetamol</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Co-codamol</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Tramodol</td>
<td>1</td>
</tr>
<tr>
<td>6.0 Endocrine system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1 Drugs used in diabetes</td>
<td>Human insulin</td>
<td>1</td>
</tr>
<tr>
<td>7.0 Obstetrics, gynaecology and urinary tract</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4 Drugs for genito-urinary disorder</td>
<td>Oxybutynin</td>
<td>2</td>
</tr>
<tr>
<td>10.0 Musculoskeletal and joint diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.1 Drugs used in rheumatic diseases and gout</td>
<td>Ibuprofen</td>
<td>1</td>
</tr>
<tr>
<td>13.0 Skin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.4 topical corticosteroids</td>
<td>Hydrocortisone</td>
<td>1</td>
</tr>
</tbody>
</table>
4.3. Costs and Savings Associated with the Pharmaceutical Discharge Service.

4.3.1. Drug Costs.

Drug costings were undertaken for eighty one patients (I=43; C=38). These were patients who were recruited into the study and for whom data on discharge medication costs were available.

4.3.1.1. Medication Changes

Number of drugs on admission

There were a total of 158 drugs on admission in the intervention group and 159 in the control group. The mean number of drugs were 3.7 per patient (SD=2.7) and 4.2 per patient (SD=2.7) for the intervention and control group patients respectively (see Table 15).

Number of medication changes made

As expected, there were a high number of changes made to admission drugs. Refer to Table 16 for a summary of the medication changes made in hospital. New medication was initiated in 38 intervention and 34 control patients accounting for 114 and 78 drugs respectively. The mean number of drugs started per patient were 2.6 (SD=1.7) and 2.2 (SD=1.5) in intervention and control groups respectively. In
47 patients, over 50% of those analysed, preadmission drugs were stopped (I=29;C=18). Additional changes were made to existing drugs in 21 patients (I=12;C=9). There were dose changes in 27 of the admission drugs (I=13;C=14).

These data support the premise that hospital admissions result in changes to existing medication for a majority of patients. This is understandable in medical patients since the mainstay of treatment is with drug therapy. This highlights the need to inform patients of relevant medication changes, since, as shown earlier, patients may revert to pre-admission regimes.

4.3.1.2. Patient Own Drugs Suitability and Reissue

Drug costs were calculated using the Watford General Hospital pharmacy catalogue of contract prices for drugs. Eighty drugs were brought in by intervention patients, 50% of the total of 158 prescribed drugs on admission (see Table 17). Of the drugs brought in, 67% met the criteria for reissue, and of these, over 80% were reissued to the patient upon discharge. In total, £97.05 was saved in hospital drug costs alone by reissuing patients own drugs. The total cost of dispensed discharge items was £374.89, and so a quarter of discharge medication costs were realised, when only 50% of PODs were brought in on admission. This calculation does not take into account container costs or pharmacy staff time. The mean cost of discharge medication was £8.33 for intervention and £9.55 for control patients.
Table 15. Summary of admission drugs.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>43</td>
<td>38</td>
</tr>
<tr>
<td>Total number of drugs on</td>
<td>158</td>
<td>159</td>
</tr>
<tr>
<td>admission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean No of drugs per patient on admission (SD)</td>
<td>3.7 (2.7)</td>
<td>4.15 (2.7)</td>
</tr>
<tr>
<td>Median number of drugs per patient on admission (Interquartile range)</td>
<td>2 (2-3)</td>
<td>2 (1-3)</td>
</tr>
</tbody>
</table>

Table 16. Summary of medication changes made in hospital.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Drugs started</td>
<td>114</td>
<td>98</td>
</tr>
<tr>
<td>Number of patients in whom started</td>
<td>38</td>
<td>34</td>
</tr>
<tr>
<td>Mean number of drugs per patient (SD)</td>
<td>2.6 (1.7)</td>
<td>2.2 (1.5)</td>
</tr>
<tr>
<td>Median (IQR)</td>
<td>2 (2-3)</td>
<td>2 (1-3)</td>
</tr>
<tr>
<td>Number of drugs stopped</td>
<td>36</td>
<td>28</td>
</tr>
<tr>
<td>Number of patients in whom stopped</td>
<td>29</td>
<td>18</td>
</tr>
<tr>
<td>Mean number of drugs stopped per patient (SD)</td>
<td>0.86 (0.8)</td>
<td>0.79 (1)</td>
</tr>
<tr>
<td>Median number of drugs stopped per patient (IQR)</td>
<td>1 (0-1)</td>
<td>0 (0-1)</td>
</tr>
<tr>
<td>Number of Drug doses changed</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Number of patients in whom dose changed</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>Mean number of dose changes per patient (SD)</td>
<td>0.3 (0.5)</td>
<td>0.4 (0.9)</td>
</tr>
<tr>
<td>Median number of dose changes per patient (IQR)</td>
<td>0 (0-1)</td>
<td>0 (0 – 0.25)</td>
</tr>
</tbody>
</table>

Table 17. Summary of suitability and reissue of patient own drugs.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of PODs brought in</td>
<td>80</td>
<td>n/a</td>
</tr>
<tr>
<td>% brought in which were suitable for extended issue</td>
<td>67%</td>
<td>80%</td>
</tr>
<tr>
<td>% brought in which were reissued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of dispensed items/ patient</td>
<td>4.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Number of reissued items/ patient</td>
<td>1</td>
<td>n/a</td>
</tr>
<tr>
<td>Cost of dispensed items (per patient)</td>
<td>£8.33</td>
<td>£9.55</td>
</tr>
</tbody>
</table>
4.3.2. Pharmacy Costs.

Activities which were undertaken that were timed were the drug history and the patient counselling sessions which were timed for all patients. The mean time to undertake the drug history session was 9 minutes per patient. The longest drug history took 30 minutes to perform. Discharge counselling took a mean time of 15 minutes per patient to undertake, with the longest session lasting 32 minutes.

The total cost of providing a pharmaceutical discharge service is dependent upon a variety of factors such as the grade of staff employed and any training requirements. If it is assumed that the costs in pharmacy staff time amount to 24 minutes per patient (mean time to conduct admission interview plus mean time to conduct discharge counselling), the ultimate costs will be determined by the grade of pharmacist required to perform these activities and the number of patients admitted and discharged per week. Other costs include travel time to and from the ward and employer costs such as national insurance and pension contributions. The time required to provide the GP with the discharge medication letter was not been determined. It is envisaged that this letter may be produced automatically by the discharge prescription labelling system with appropriate software.

Dispensary activity was not directly measured. Since there was a reduction in the number of dispensed items in the intervention group, it can be implied that there is a modest (one drug per patient) saving in the number of discharge items that the dispensary has to issue. Furthermore, dispensary intervention rates between
standard discharge prescriptions and those prepared by the research pharmacist were not evaluated. A reduction in the proportion of discharge medication orders questioned in the dispensary or the time to clarify prescriptions may realise additional dispensary savings.

4.4. GP Satisfaction Survey.

The GP opinion questionnaire, comprising a self-completed questionnaire and covering letter, were posted to the study patient’s GP when the patient was discharged from hospital. It accompanied the discharge summary for control patients, and the discharge summary and discharge medication letter for intervention patients. On one of the study wards, the discharge correspondence was posted to GPs via the hospital’s mail system, and on the other ward the discharge correspondence was given to the patient by the nurse, to take to their GP.

Eighty eight questionnaires (I=45;C=43) were sent out, this number corresponding to the number of patients recruited in hospital. Sixty four (I=36;C=28) questionnaires were returned, a response rate of 73% (I=80%;C=65%). The data obtained was analysed using SpSS software. All data analyses compared intervention with control. Since the methods for transfer of discharge correspondence differed between the two wards, data on the time to receive information and satisfaction with method of information transfer was also analysed comparing wards.
4.4.1. Time Taken To Receive Discharge Correspondence.

The date of discharge was used to determine the number of days after discharge that the discharge correspondence was received, as the discharge correspondence should have been sent to the GP on the day of discharge. The data was analysed for both intervention group versus control group and for Heronsgate ward versus Aldenham ward (refer to Table 18). Comparing the intervention and control groups, the discharge summaries were received a median 3 days after discharge in both groups. Similarly, receipt of discharge summaries, when comparing Aldenham and Heronsgate wards occurred in a median of 3 days. This data supports the conclusion that sending more complete information in the form of a discharge medication letter does not delay the receipt of discharge information by the general practitioners. Furthermore, there is no difference, in terms of receipt of discharge information between using the patient or a courier.

4.4.2. GP Opinion Of Receipt Of Discharge Information.

GPs opinion was sought in order to determine whether they were satisfied with the time taken to receive the discharge information (refer to Table 19). The results indicate that there was no difference between the intervention and control groups and that approximately 80% of all GPs expressed satisfaction at having the discharge information in time to review the patient’s medication requirements. However, it should be noted that in 2 out of 28 control patients, the GP claimed not to have received the discharge summary at all. One questionnaire each was sent from Aldenham and Heronsgate wards.
### Table 18. Time to receive discharge summary (Patient and ward groups)

<table>
<thead>
<tr>
<th></th>
<th>Aldenham Patient</th>
<th>Heronsgate Courier</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of responses</td>
<td>39</td>
<td>25</td>
<td>45</td>
<td>43</td>
</tr>
<tr>
<td>Time to receive discharge summary</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median (days)</td>
<td>3</td>
<td>3</td>
<td>3 (2 – 5)</td>
<td>3 (1-5)</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>1-4</td>
<td>2-6</td>
<td>2 not completed</td>
<td>1 not completed</td>
</tr>
<tr>
<td>Missing data</td>
<td>3</td>
<td>2</td>
<td></td>
<td>2 discharge summaries not received</td>
</tr>
</tbody>
</table>

### Table 19. GP Satisfaction with Timeliness of Receipt (patient and ward groups)

<table>
<thead>
<tr>
<th></th>
<th>Aldenham</th>
<th>Heronsgate</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of responses</td>
<td>39</td>
<td>25</td>
<td>45</td>
<td>43</td>
</tr>
<tr>
<td>Medication Received in sufficient time to initiate further supply</td>
<td>0</td>
<td>3</td>
<td>32 (89%)</td>
<td>25 (89%)</td>
</tr>
<tr>
<td>Medication not received in sufficient time to initiate further supply</td>
<td>3 – not completed</td>
<td>1 – discharge summaries not received</td>
<td>2 (6%)</td>
<td>1 (4%)</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td>2 (6%) – not completed</td>
<td>2 (7%) – discharge summaries not received</td>
</tr>
</tbody>
</table>
The questionnaire was designed to be sent with the discharge summary, although this was left to the ward clerk or nurse to arrange. It appears that for the two control patients, the discharge summary was mailed separately. It cannot be determined when the discharge summary was sent or whether it was sent at all, but that on the date the questionnaire was received, the discharge summary had not been received.

4.4.3. GP Opinion Of Legibility of Information.

In all of the questionnaires returned by GPs, there were no concerns regarding poor legibility of the information on discharge medication (I=36;C=28). This question was asked because concern had been raised on the legibility of handwritten discharge of summaries by general practitioners at the beginning of the research. Typewritten information is considered to be superior to handwritten information in terms of legibility. At Watford general hospital standard practice is that the top copy of the discharge summary is sent to the GP, the second copy retained in the patient’s medical notes and the bottom copy retained by the hospital pharmacy. Since the discharge summary is a self-carbonated triplicate form, the top copy has the actual writing, and the lower copies are carbonated. The top copy would be the most legible, and since this is sent to GPs, no problems should be expected. One problem concerning discharge medication on handwritten summaries arose in the instance where the discharge drugs were not listed at all, and it was documented that the patient’s existing medication had been continued.
4.4.4. **GP Opinion of Completeness of Discharge Summary**

A question was asked to determine how well the discharge medicines letter compared with the discharge summary in terms of the information it carried.

In six, out of thirty four intervention questionnaires returned, the GP felt that there was an omission. Further questioning revealed that in one case, the missing information was the date of discharge, which although stated on the discharge medicines letter was missing from the discharge summary. In one case, there was no clarification of what information was lacking. One GP was confused by the fact that the discharge drugs were not written on the discharge summary but on a separate letter and cited this. Finally, in two cases, omissions were for anticoagulant drugs. One GP complained of not being informed of the anticoagulation clinic follow-up, which is considered by the author to be the responsibility of the doctor. In the second case, there was no detail of target INR or length of treatment of warfarin. When patients were discharged on warfarin, the pharmacist stated the strengths of tablets supplied and that for dosage details GP should refer to the anticoagulation booklet supplied to the patient by the hospital. It was assumed that information such as the target INR and duration of treatment would be stated in the discharge summary. However it seems that in practice this does not always occur. Since this information is readily available to the pharmacist, it would possible to include it in the discharge medicines letter as long as this was agreed with hospital clinicians. This will be discussed further in the next chapter. Table 20 summarises GP opinion of completeness of medicines related information received in the discharge correspondence.
Five control GPs felt that pertinent information was lacking, which is similar to the proportion of intervention GPs. However, although only two specific drug cases were mentioned by intervention GPs, control GPs cited seven specific drugs in addition to one case where no drugs had been listed on the discharge summary when the patient had been discharged on several. One GP said that his patient was changed from omeprazole to lansoprazole and no reason for the change was given.

The hospital had, at this time, recently switched from omeprazole to lansoprazole as the proton pump inhibitor of choice, and patients admitted on omeprazole were often changed to lansoprazole for this reason. However, it was acknowledged by the hospital that the patient could continue their omeprazole on discharge. This was not mentioned in the discharge summary. In the discharge medicines letter this was stated, and GPs were informed of medication changes made for formulary, not clinical reasons, and that the patient was able to continue with their previous medication. One GP stated that Burinex K was omitted from the discharge summary. One GP made several comments, including the fact that there was no form aspirin, no generic name for Imdur®, and that stating a dose as daily was not helpful, since it helped the patient if the time of day was stated, i.e. morning or night instead of daily.
Table 20. GP Opinion on Completeness of Discharge Summary.

<table>
<thead>
<tr>
<th>Nature of missing information</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of discharge</td>
<td>28 (78%)</td>
<td>21 (75%)</td>
</tr>
<tr>
<td>No discharge drugs on discharge summary</td>
<td>21 (71%)</td>
<td>20 (72%)</td>
</tr>
<tr>
<td>No target INR/length of treatment with warfarin</td>
<td>15 (59%)</td>
<td>5 (18%)</td>
</tr>
<tr>
<td>No anticoagulation clinic follow-up</td>
<td>2 (8%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>No clarification of what is missing in 2 cases.</td>
<td>3 (12%)</td>
<td>1 (4%)</td>
</tr>
</tbody>
</table>

Table 21. Satisfaction with Vector (patient group)

<table>
<thead>
<tr>
<th>% satisfied with vector</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>22 (61%)</td>
<td>23 (82%)</td>
<td></td>
</tr>
<tr>
<td>12 (33%)</td>
<td>4 (14%)</td>
<td></td>
</tr>
<tr>
<td>2 (6%)</td>
<td>3 (4%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 22. Satisfaction with Vector (ward group)

<table>
<thead>
<tr>
<th>% satisfied with vector</th>
<th>Aldenham</th>
<th>Herongate</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 (77%)</td>
<td>15 (60%)</td>
<td></td>
</tr>
<tr>
<td>8 (21%)</td>
<td>8 (32%)</td>
<td></td>
</tr>
<tr>
<td>1 (3%)</td>
<td>1 (8%)</td>
<td></td>
</tr>
</tbody>
</table>
4.4.5. Satisfaction with Current Method for Sending Discharge Information.

82% of control GPs were satisfied with the method of sending discharge information compared with 61% of intervention GPs (see Table 21).

Comparison of time taken to receive discharge information and satisfaction with method of sending the information and satisfaction with method of sending the information was also made between Aldenham and Heronsgate ward, since they operated different systems. 77% and 60% of GPs were satisfied with the methods of delivery of the discharge correspondence (see Table 22).

Refer to Table 23 for details of additional comments made by general practitioners.

4.5. Patient Views.

Patient data was analysed using the Statistical Package for Social Scientists (SpSS). A coding frame was devised and patient data entered onto the coding frame and then onto the computer. Complete data sets were obtained for seventy patients in total, thirty seven patients were in the intervention group and thirty three patients were in the control group. Exploratory and confirmatory statistical methods were used in the data analysis. The data obtained can be divided into five sections, namely patient demographics, medication taking habits, the provision of verbal and written information on discharge medication, perceived problems with medication since discharge, and contact with physicians after discharge from hospital.
Table 23. Additional comments made by GPs.

INTERVENTION

'This time it arrived early, and was legibly completed. Usually, it arrives later with info lacking/illegible. Faxing would help it arrive earlier. SORRY - this refers to the doctors discharge summary! The pharmacy medication letter is good - I am satisfied!'

'Please make it smaller than A4!! Our files are bursting with two folds of letters.'

'Reasons for discontinuing medication (e.g. Mrs. X digoxin) would be helpful..'

'The form sent out this time was better than the usual form as it was legible.'

'The pharmacy letter is a good idea as it is typed and strengths, doses, etc. clearly stated.'

'Keep using these printed lists of drugs please!'

'Much better than leaving it to the doctor to write up - particularly discontinued medication section as this clarifies that medication has not been left off by accident which does happen.'

'Printed discharge note a big improvement on the hand-written ones! DOB should be included - this is needed for patient identification esp. to find patient on computer.'

'It means twice the paper i.e. pharmacy paper and ward discharge.'

'I like typed sheets. Accurate and quick, helps us particularly what has been stopped - (illegible) in hospital as this causes us confusion particularly things like hypertensives, diuretics etc.'

'Its about time it came on this form! Keep up the good work.'
CONTROL

' Although I haven’t yet received the letter, I don’t believe that it would be fair of me to criticise, as I know that the hospital staff (all of them!) work extremely hard.'

' I find the current system very satisfactory.'

' Often not enough information re how long to continue courses or when to cut down doses or when to stop drops (eye).'

' Would like to know why a drug which the patient is taking for a long time is changed to something for other than clinical reason. ' This refers to patients omeprazole being changed to the hospital formulary lansoprazole, while patient was in hospital.

' Whether drugs should be continued or not '

' It was Becotide 200mcg pre hospital admission but on discharge was sent on 50mcg inhaler. Patient was admitted with MI. Age 50. I do not feel the 50mcg Becotide was correct dose for him but I know this was the doctors fault not yours.'

' History often too brief to understand medication and management plan. No follow-up arrangement re short term management given.'

' The discharge medication is usually the most useful piece of information on the form.'

' Good example of not sending a discharge summary.' Comment made by a GP who had not received the discharge summary.

' Handwriting must be legible.'
4.5.1. **Patient Demographics.**

Demographic details are detailed in Table 24. The control and intervention groups were well matched for age, gender, length of stay in hospital and timing of home visit.

4.5.2. **Patient Use of Medication and Information Received on Discharge.**

Patients were asked a series of questions relating to their discharge medication. They were asked who was responsible for the administration of medication and whether any particular aid was used to remember when to take the medication. Patient opinion was sought on the level of verbal and written counselling received on discharge medication.

4.5.2.1. **Primary Respondent**

In the majority of interviews (84%, I=32;C=27) the main respondent was the patient. In 14% of interviews the spouse augmented the patient’s response, (I=4;C=4), or by their son/daughter (I=2). In two interviews (C=2) the spouse was the main respondent.
Table 24. Demographic details of study patients.

<table>
<thead>
<tr>
<th></th>
<th>Intervention n=37</th>
<th>Control n=33</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Inter-quartile range</td>
<td>58 – 78</td>
<td>62 – 79</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male (%)</td>
<td>20 (54%)</td>
<td>16 (46%)</td>
</tr>
<tr>
<td>Female (%)</td>
<td>17 (46%)</td>
<td>19 (54%)</td>
</tr>
<tr>
<td><strong>Length of stay (days)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Inter-quartile range</td>
<td>4 - 7</td>
<td>2 - 6</td>
</tr>
<tr>
<td><strong>Timing home visit (days after discharge)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>Interquartile range</td>
<td>22-30</td>
<td>19-29</td>
</tr>
</tbody>
</table>

Table 25. Medication Taking Habits.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary respondent</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient</td>
<td>32 (86.5%)</td>
<td>27 (81.8%)</td>
</tr>
<tr>
<td>Patient &amp; Spouse</td>
<td>4 (10.8%)</td>
<td>4 (12.1%)</td>
</tr>
<tr>
<td>Spouse solely</td>
<td>-</td>
<td>2 (6.1%)</td>
</tr>
<tr>
<td>Patient &amp; Son/Daughter</td>
<td>1 (2.7%)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Responsibility for taking medication</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No help</td>
<td>27 (73%)</td>
<td>25 (75.8%)</td>
</tr>
<tr>
<td>Spouse/partner helps</td>
<td>6 (16.2%)</td>
<td>8 (24.2%)</td>
</tr>
<tr>
<td>District nurse helps</td>
<td>3 (8.1%)</td>
<td>-</td>
</tr>
<tr>
<td>Other relative helps</td>
<td>1 (2.7%)</td>
<td>-</td>
</tr>
</tbody>
</table>
4.5.2.2. Medication Taking Habits and Reminders.

74% of patients (I=27;C=25) claimed to be solely responsible for taking their medication. The remaining 26% had help, primarily from the spouse (20%, I=6;C=8), one patient had help from another relative, and three patients had help from the district nurse (refer to Table 25).

Forty nine patients (I=24;C=25) claimed that they used memory alone when remembering to take their medication. Fourteen patients (I=10;C=4) used a written or printed list, whereas only four patients (I=2;C=2) used a medication aid. A further three patients (I=1;C=2) were prompted to take their medication by a family member. The low use of a medication aid was expected since patients were selected from medical wards and not elderly care wards.

4.5.2.3. Patient Recall of Receipt of Discharge Medication and Verbal Information

Thirty eight patients (I=10;C=28) recalled that the nurse had given them their discharge medication, twenty two patients (I=20;C=2) recalled the pharmacist and seven patients (I=6;C=1) could not remember. Intervention patients were counselled by a pharmacist, whereas for control patients the standard discharge practice was that a nurse was responsible for issuing discharge medication and providing instructions. Two patients collected their discharge drugs from the pharmacy (I=1;C=1). One patient had not received any discharge medication, and their discharge summary stated 'patient's own' (C=1). Refer to Table 26.
Table 26. Patient Recall of which Health Care Professional gave them Discharge Medication.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Nurse</td>
<td>10</td>
<td>27</td>
<td>28</td>
<td>85</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>20</td>
<td>55</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Don’t know/ can’t remember</td>
<td>6</td>
<td>16</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Husband collected later</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>N/A</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 27. Patient recall of being counselled on medication prior to discharge.

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th></th>
<th>Control</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Counselling study pharmacist</td>
<td>21</td>
<td>57</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Not counselled</td>
<td>5</td>
<td>14</td>
<td>13</td>
<td>39</td>
</tr>
<tr>
<td>Counselling by nurse</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>39</td>
</tr>
<tr>
<td>Counselling by nurse/doctor and study pharmacist</td>
<td>10</td>
<td>27</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Counselling, can’t remember who by</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Counselling by hospital pharmacist</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Counselling by doctor</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Counselling by doctor and nurse</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>N/A – no medication issued</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
The number of patients who could not recall who had given them their discharge medication was quite high in the intervention group and this will be examined further in the discussion.

Patients were asked whether they had been told anything about their medication (refer to Table 27). Nearly 40% of control patients commented that they were not told anything about their medication, whereas 13% of intervention patients claimed this. The responses of the intervention group are interesting since all intervention patients had been counselled by the research pharmacist. This result could be attributable to the research pharmacist undertaking both the intervention in hospital and interview at the home visit, and also underlines the importance of reliance on memory for answering questions. This finding will be examined further in the discussion.

4.5.2.4. Patient Recall and Utilisation of Written Information

Another interesting finding regarded the provision of written information on discharge. Five intervention patients claimed not to have received any information. Thirty two intervention patients (84%) recalled being supplied with written information on discharge medication, and twenty eight patients had the written information available at the home visit. Twenty two patients remembered receiving the patient reminder chart, four patients recalled receiving an anticoagulation booklet and two patients recalled receiving both the patient reminder chart and the anticoagulation booklet. All intervention patients had been provided with a patient reminder chart on discharge from hospital. Twenty six
patients had found the information useful. Of the control patients, twenty five patients (76%) claimed to have received no written information, and one patient could not remember. The seven patients who had received information had an anticoagulation booklet (4 patients), an industry produced patient information leaflet for amiodarone (2 patients), and a steroid card (1 patient). All control patients still had their written information and had found it useful.

Twenty one intervention patients had shown their information to others, as detailed in Table 28. as can be seen, most patients (12 patients) had shown the information only to their GP. The reminder had shown it to other members of the family, to the anticoagulation clinic and other hospital doctors, and to the practice nurse. Of the seven control patients who had received written information, three patients had shown it either to family or the anticoagulation clinic.

4.5.3. Patient Identified Problems With Medicines Since Discharge

Thirty five patients (l=11;C=24) reported that they had experienced problems with their medicines since discharge (chi squared value=11.2, df=1, p=0.01). The null hypothesis G1 that there is no difference in the prevalence of problems reported by patient is rejected and the alternative hypothesis that the pharmaceutical discharge service reduces the number of patients who report medication related problems after discharge is accepted. All patients' responses are documented in Table 29. The majority of problems identified by patients are related to concerns about side
Table 28. Person to whom information shown.

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>7</td>
</tr>
<tr>
<td>Not shown</td>
<td>9</td>
</tr>
<tr>
<td>shown</td>
<td>21</td>
</tr>
<tr>
<td>shown to:</td>
<td></td>
</tr>
<tr>
<td>spouse/family</td>
<td>3</td>
</tr>
<tr>
<td>anticoagulant clinic</td>
<td>1</td>
</tr>
<tr>
<td>GP</td>
<td>12</td>
</tr>
<tr>
<td>DN and GP</td>
<td>1</td>
</tr>
<tr>
<td>Nurse at surgery</td>
<td>2</td>
</tr>
<tr>
<td>GP and other hospital</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 29. Patient identified problems with medication since discharge.

<table>
<thead>
<tr>
<th>Type of problem</th>
<th>Patient type (I/C)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply I</td>
<td>Ran out of lisinopril</td>
<td></td>
</tr>
<tr>
<td>Supply I</td>
<td>Ran out of inhalers</td>
<td></td>
</tr>
<tr>
<td>Supply I</td>
<td>Delay in getting repeat prescription</td>
<td></td>
</tr>
<tr>
<td>Supply C</td>
<td>Did not need 3mg strength warfarin.</td>
<td></td>
</tr>
<tr>
<td>Supply C</td>
<td>Own tablets were not returned on discharge</td>
<td></td>
</tr>
<tr>
<td>Supply C</td>
<td>Own tablets were discarded by hospital.</td>
<td></td>
</tr>
<tr>
<td>Supply C</td>
<td>Own supply confiscated.</td>
<td></td>
</tr>
<tr>
<td>Name of drug C</td>
<td>Is calcichew the same as calcium carbonate, as patient was confused because hospital and community supply different</td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>When got supply of bendrofluazide from GP dose was 5mg, but dose on discharge was 2.5mg</td>
<td></td>
</tr>
<tr>
<td>Side effects I</td>
<td>Have had a dry cough <em>(on captopril)</em></td>
<td></td>
</tr>
<tr>
<td>Side effects I</td>
<td>Flatulence with simvastatin</td>
<td></td>
</tr>
<tr>
<td>Name of drug C</td>
<td>Felt sick and rang GP re azathioprine as newly started, told to continue which she did and was sick again. Rang hospital consultants secretary and was told to stop tablets</td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Sotalol made patient sleepy and tired. Problems with driving - slower reaction time. Not so worried</td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Sotalol dose halved by GP.</td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Felt headachy, a dull ache - don’t normally have them. <em>(started Imdur 60mg daily by hospital)</em></td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Feeling sickly all the time. Own GP came and examined. <em>(Stemetil tablets prescribed, and digoxin dose halved by GP)</em></td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Sick with calcichew, now taking it before bed.</td>
<td></td>
</tr>
<tr>
<td>Dose C</td>
<td>Headache with imdur</td>
<td></td>
</tr>
</tbody>
</table>

190
<table>
<thead>
<tr>
<th>Concerns</th>
<th>C</th>
<th>Frightened water would build up again and doesn’t know what tablets are for (Patient had had an anterior MI, and bilateral effusions - not discharged on diuretics as effusions resolving)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom related to current drug therapy</td>
<td>I</td>
<td>Was SOB on discharge from hospital. Contacted GP who told him to take 2 water tablets. Since then, he has felt a lot better. Why couldn’t the hospital give the right dose before.</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>When completed course of antibiotics, temperature went up. GP started further course of antibiotics</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Ankles swollen after leaving hospital. GP increased dose of captopril and frusemide.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>More antibiotics needed. Went to GP.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>The diabetes nurse rang. Patients blood sugar high, therefore dose of insulin changed. Hoping to reduce steroids.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>One lot has not been doing any good - GP added another (mebeverine, patient initially discharged on co-danthrusate caps)</td>
</tr>
<tr>
<td>Symptom (other)</td>
<td>I</td>
<td>Have had heartburn and taken otc antacid</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Feeling dizzy and ill after discharge from hospital, rang research pharmacist and advised to see GP, which she did.</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Feeling nauseous and faint and poor sleep.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Oxybutynin stopped by GP, since then spasms and leakage.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Still have a dry cough</td>
</tr>
<tr>
<td>Administration</td>
<td>C</td>
<td>Forgot to take warfarin one evening, looked in booklet for advice, and was re-assured. Did not need to contact GP</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Daughters had to write on medication containers (how often to take/use) and organised it for her</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Takes frusemide at noon, asked GP if OK to do.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Having difficulties with CRCs</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Found it very difficult in first couple of weeks as having to do reducing doses of amiodarone and prednisolone</td>
</tr>
<tr>
<td>Formulation of drug</td>
<td>C</td>
<td>Discharged on nebulisers, but usually uses inhalers, which are different. Didn’t know which to use.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Prednisolone was not e/c therefore not taken - own taken instead.</td>
</tr>
<tr>
<td>C</td>
<td>Amiodarone did not suit</td>
<td></td>
</tr>
<tr>
<td>Painkillers not suitable - trouble with toilets for 2 days (constipation). Fluoxetine causing tummy aches and unsteadiness on feet</td>
<td>C</td>
<td></td>
</tr>
</tbody>
</table>
effects and the supply of medicines. Patients also experience disease symptoms which may be related to their hospital admission. Administration of drugs was cited as causing problems by six patients (C=6).

4.5.4. Patient Identified Unanswered Questions On Discharge Medicines.

Twenty patient (I=4;C=16, chi squared value=6.93, df=1, p=0.01) claimed that they had questions on medicines before leaving hospital that had not been answered. The null hypothesis G2 that there is no difference in patient identified questions relating to discharge medication between control and intervention patients is rejected in favour of the alternative hypothesis that the pharmaceutical discharge service reduces the number of patients who have outstanding questions about their discharge medication. Patient responses are detailed in Table 30. The largest group of questions that patients felt they would have liked answered related to the indications for newly prescribed drugs and the reasons why existing medication was stopped. Patients also had unanswered questions about supply of medication and side effects.

4.5.5. Contact With Hospital After Discharge.

Patients reported whether they had attended any hospital department in the time period between discharge from hospital and the domiciliary visit. Twenty five patients (36%, I=13; C=12) had visited a hospital for a variety of reasons which are given in Table 31. Most patients had attended medical or surgical clinics,
Table 30. Patient Identified questions on discharge medication.

<table>
<thead>
<tr>
<th>Type of problem</th>
<th>Pat type (I/C)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on what new medication is for and reasons why old medication stopped</td>
<td>C</td>
<td>Wasn’t told what medication is for.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Water tabs stopped and patient not told why. Saw consultant at clinic and complained of swollen ankles, and told to go back on it. (water tablets had not been noted in admission drug history in notes)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Want to know whether to take water tablets (Patient had had an anterior MI, and bilateral effusions - not discharged on diuretics as effusions resolving - On GP letter noted that patient was anxious and given diazepam tablets)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>wants to know want tabs are for and what they do</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Wasn’t told what tablets for or anything. Frightened. Does own chart. Respiratory nurse came twice to see.</td>
</tr>
<tr>
<td>Side-effects I</td>
<td>I</td>
<td>Side effects of aspirin as dose increased and worried she might get an ulcer. Community pharmacist had queried the dose also</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Side-effects of azathioprine</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>did not know tablets could make her sick</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Written s/e of azathioprine</td>
</tr>
<tr>
<td>Supply</td>
<td>C</td>
<td>It was not spelt out what was needed. Confusion with disopyramide, as given caps not tabs, so had to see GP.</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Normally get sleeping tablets and Ensure plus - had none in hospital or on discharge. (Not listed in admission drug history in notes)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>What to do with warfarin 3mg strength as not using</td>
</tr>
<tr>
<td>Disease management</td>
<td>I</td>
<td>Said that his eyes were blurry and someone said it could be tabs. Went to GP who said it was more likely to be due to diabetes. Would have liked to be have been told in hospital.</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>What kind of infection did I have (UTI)</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>Stomach trouble in hospital - bowels had not opened for 5 days. Wanted bowel medicine, but was in a lot</td>
</tr>
</tbody>
</table>
of pain in the end, and needed 5 enemas.

<table>
<thead>
<tr>
<th>Existing medication</th>
<th></th>
<th>What to do with existing medication (<em>Patient started on salbutamol and atrovent nebs qds, and beclomethasone inhaler four times a day. Normally uses beclomethasone inhaler twice a day and salbutamol inhaler when required only, reverted back to initial therapy</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Misc</td>
<td>C</td>
<td>Left in a daze!</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>More information on project</td>
</tr>
</tbody>
</table>
and one patient had been to the hospital casualty department. In five instances, prescriptions were issued and these were documented as intentional changes to medication (see section 4.2.5.) The study objectives did not include potential reductions in hospital readmissions with the pharmaceutical discharge service, and was not powered to detect such changes. Contact with hospital doctors may result in medication changes shortly after discharge from hospital and further highlights the need for effective communication.

4.5.6. Contact with GP Surgery After Discharge.

Fifty six patients (80%, I=31;C=25) had been in contact with their GP surgery on one or more occasions since discharge for a variety of reasons. In forty instances the patient had visited the GP in the surgery, and in thirty six cases the patient had seen their own GP. Patients had also been seen by other GPs at the same practice or by locum GPs. In some instances, patients did not see a doctor but had contact with other staff. The process of contact with the GP is not a simple ‘patient goes to see own GP after discharge’, but more complex with other representatives of the patient and other health care workers involved. This is relevant since the first doctor to see the patient after discharge may not be their own GP which is another reason why medication changes made in hospital need to be explained clearly to patients. The purpose of the contact with the GP surgery was elucidated and as can be seen from table 33 there were complex reasons given.
Table 31. Hospital Contact Following Discharge.

<table>
<thead>
<tr>
<th>Question</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of patients</td>
<td>37</td>
<td>33</td>
</tr>
<tr>
<td>No contact with hospital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (total)</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>13 - to Watford General Hospital</td>
<td></td>
<td>11 - to Watford General Hospital</td>
</tr>
<tr>
<td>Yes once</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Yes more than once</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Where attended:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anticoagulant clinic</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Chest clinic</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>other medical clinic</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Surgical clinic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>casualty</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Other hosp - cardiology clinic</td>
<td>0</td>
<td>(2 missing)</td>
</tr>
<tr>
<td>Prescription issued</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1(1 missing)</td>
<td>4**</td>
</tr>
<tr>
<td>Yes</td>
<td>24</td>
<td>21</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* 1) Milpar prescribed
**1) Sotalol prescribed by casualty, dispensed by community pharmacy
  2) Dihydrocodeine prescribed after patient had injection into knee in clinic
  3) More warfarin prescribed in anticoagulant clinic
  4) Nicorandil prescribed by Harefield hospital cardiology clinic physician
Table 32. GP Contact Following Discharge.

<table>
<thead>
<tr>
<th>Method of contact</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient visit to surgery</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Telephone only</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>GP visit to patient</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Patient visit GP and GP visit patient</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Spouse went to surgery</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Other relative went to GP</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>GP and other doctor visits to patient</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>letter to GP</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>N/A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health care worker contacted</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own GP</td>
<td>17</td>
<td>12</td>
</tr>
<tr>
<td>Locum GP</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Receptionist</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Another GP same practice</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Own GP and Other GP</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>GP and Nurse</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>No-one (put discharge summary in box)</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>n/a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 33. Reasons Cited By Patients For Contacting GP Surgery.

<table>
<thead>
<tr>
<th>Reason 1</th>
<th>Reason 2</th>
<th>No of pts</th>
<th>Intervention</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliver discharge letter</td>
<td>Get repeat prescription</td>
<td>15 (24%)</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td></td>
<td>12 (19%)</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Admission related problem</td>
<td>6 (10%)</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Deliver discharge letter</td>
<td>Get repeat prescription</td>
<td>5 (8%)</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Deliver discharge letter</td>
<td>Get repeat prescription</td>
<td>5 (8%)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Deliver discharge letter</td>
<td>Admission related problem</td>
<td>4 (7%)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Deliver discharge letter</td>
<td>Get repeat prescription</td>
<td>3 (5%)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Admission related reason</td>
<td>Get repeat prescription</td>
<td>2 (3%)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Admission related reason</td>
<td>Non-admission related reason</td>
<td>2 (3%)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Non-admission related reason</td>
<td>Non-admission related reason</td>
<td>1 (2%)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Deliver discharge letter</td>
<td>Blood test</td>
<td>1 (2%)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Blood test</td>
<td>1 (2%)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Deliver discharge summary</td>
<td>Get repeat prescription</td>
<td>1 (2%)</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Routine check-up</td>
<td>1 (2%)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Non-admission related reason</td>
<td>1 (2%)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Non-admission related reason</td>
<td>1 (2%)</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Get repeat prescription</td>
<td>Blood test</td>
<td>1 (2%)</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

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The main findings of the RCT affirmatively answer the research question of whether a pharmaceutical discharge service reduces medication errors when medical patients have been discharged from hospital. Furthermore, it was shown that intended changes to medication made by the GP occur frequently shortly after discharge and this makes the provision of timely, accurate and comprehensive information on discharge medication essential. Modest savings from the return of patients’ own medication can be made but this may not recoup the cost of providing the service. The benefits and drawbacks of the pharmaceutical discharge service, limitations of the research and future developments are discussed in the following chapter.
CHAPTER FIVE. DISCUSSION.

This chapter will discuss the main findings reported in the previous chapter and the benefits and drawbacks of a pharmacy discharge scheme. The limitations and generaliseability of the research will be examined and suitable areas for further research identified.


It was hypothesized that a pharmaceutical discharge service would reduce the number of medical patients with medication errors when discharged from a district general in West Hertfordshire. Evidence from this study indicates that the pharmaceutical discharge service significantly reduces the number of patients experiencing medication errors from 54% to 11%. Almost one in five drugs prescribed to general medical patients in the control arm were associated with a medication error compared to one in 33 drugs prescribed to patients in the intervention arm. Furthermore, both system errors and patient errors were reduced, which translates to an improvement in information transfer between the hospital and GP and between the hospital and the patient. Errors occurring on admission accounted for a quarter of all errors and involved inadequate or incomplete history taking on admission. This was ascertained by recording details of the drug history documented in the patient's hospital medical notes for control patients, whereas for intervention patients the hospital pharmacist acquired drug history was recorded. The quality of information on admission drugs provided to hospital health care workers is as relevant in terms of preventing subsequent errors
on discharge as that of information provided to GPs on discharge medication, but this area has been neglected. 40% of medication errors related to inaccuracies in medication errors held by general practitioners. Since many GP surgeries provided repeat prescription lists as a record of currently prescribed drug therapy there was a potential for patients to request medication which was no longer appropriate. Overall 17%, 12 out of 70, of patients were found to have changes in their medication which were not intended by clinicians, with 7 patients intentionally changing medicine and 5 patients not comprehending to the correct regimen. Patient nonadherence to medication was determined by questioning the patient, and it is acknowledged that this may underestimate nonadherence\(^{211}\). A medication dose count was not considered since patients may take pre-admission and post-discharge supplies of medicine and render the dose count invalid. Reasons for low pharmaceutical discharge service reduces medication errors take into account the nature of errors encountered. Patients may revert to pre-hospital medication if they are unaware that medication has been changed by the hospital. A formal examination of preadmission drugs (PODs) not only clarifies the medication history, but also facilitates the destruction of medicine that is no longer required. Notifying GPs and patients of medication changes such as discontinued medication is as important as providing information on new medication. It is felt that the new format of information provided to GPs on discharge medicine enables records to be easily updated. Among medical patients, error rates of 22% to around 50% have been reported by investigators in the UK\(^{50-52}\) and the USA\(^{49}\). The mean number of discharge drugs was high in the American study\(^{49}\), with a mean number of 5.6 drugs for patients, since the authors specifically recruited patients who were taking four or more prescribed
drugs. Duggan reported a discrepancy rate of 53% in medication supply after discharge \(^{(52)}\). Eagleton assessed the deviation from the prescribed regimen by tablet count and direct questioning of fifty general medical patients recently discharged from hospital \(^{(51)}\). She reported discrepancies occurred in 11 patients (22%), and that 5 patients were found to have poor comprehension and 6 patients had good understanding of their medication. This compares favourably to the 17% prevalence of patient errors found in this study.

It should be reinforced that the terms GP errors and hospital errors apply to the location of the errors, with hospital errors reflecting inadequacies in the transfer of information from the GP to the hospital and GP errors reflecting inadequacies in the transfer of information from the hospital to the GP, and do not blame the health care professionals involved. Following publication of many studies investigating discrepancies in medication when patients move between primary and secondary, there is often debate on the research with contributors to the letters page commenting on the one-sidedness of the research, i.e. it is often seen as being from a hospital’s point of view. As with all medication error research, a systems approach is needed which does not blame individuals for errors, but attempts to design systems where errors are minimised.

It is hoped that these results, notwithstanding the limitations described in the next section, will encourage hospital pharmacy managers to put into place specific discharge planning practices and to develop the role of the pharmacist at the interface to improve communication to general practitioners and patients.
Community pharmacists are in an ideal position to receive a copy of the discharge medicines letter and to act on the information received.

5.2. Limitations Of Research And Generaliseability.

This research generated some anomalous results which are worth considering. In the recruitment of patients, it was found that the number of patients who were approached for consent but refused in hospital differs between the two groups, accounting for 25 intervention and 4 control patients. In the previous chapter, it was considered that the higher refusal rate in the intervention group may be a consequence of the need to recruit these patients shortly after they are admitted to hospital. Patient awareness and understanding of the proposed research and the ability to make an informed decision are essential for informed consent to apply. Illness may impair a patient's awareness, understanding and making decisions and in many cases, patients can be considered to be most acutely ill when admitted to hospital.

There were a few unexpected findings concerning patient recall of who gave them their medication, and whether any written or verbal information was provided. A greater proportion of intervention than control patients could not remember who had given them their medication, 18% of intervention patients claimed they were not counselled on discharge and 14% of intervention patients claimed not to have received any written information. All intervention patients were counselled and received written information. Two possible reasons could be patient confusion of the meaning of the question or poor recall of the event in question. If the patient...
is tired or anxious, then effective communication is limited and recall of the
information provided may be low. Prior to discharge, the patient’s thoughts may
be on the journey home and how they will cope once home, and may not be
concentrating on a discharge interview. Ideally, information should be
forthcoming throughout a patients stay in hospital and reinforced on discharge.

The research methods adopted a randomised, controlled trial using scheduled
interview with patients and postal questionnaires to general practitioners as the
main data collection tools. The study was open, i.e. neither the patient nor the
investigator were blinded. The research reliability and validity are described.
Reliability refers to the reproducibility and consistency of a research tool, whereas
validity determines whether the research instrument measures what it intends to
measure. Internal validity occurs where ‘the investigator can validly infer that the
results obtained were owing to the influence of the experimental variable (ie the
independent variable) affected the dependant variable’ and that the external
variable is obtained ‘when it is possible to generalise the results to a wide setting’.

Errors and biases threaten the reliability and validity of experiments. It is
accepted that these research findings may be prone to bias due to the investigator
(investigator bias) and the anxiety and desire of the patient to please the
investigator (evaluation apprehension). Other types of bias include sampling bias,
selection bias and recall bias. Blinding the patient or respondent, and/or the
investigator reduces investigator bias and is desirable. Blinding is appropriate for
drug trials but may not be possible for evaluating other health care interventions
such as comparing keyhole surgery to conventional surgery. In these cases a separate blinded evaluator measuring the outcome or dependant variable is advocated. In this study, the researcher applied the intervention and the subsequent measurement of outcome, which can be regarded as a potential source of intervention bias and a limitation of the study. Reducing interviewer bias may be possible by limiting researcher contact with the respondent, in which case the patient self administer a postal questionnaire. However, since the study required the examination of medication it was inappropriate for the patient responses to be determined using a postal questionnaire, although both of the GP questionnaires were postal and not liable to interviewer bias. A separate interviewer who was blinded may have been used to conduct the patient interviews but responses to specific questions would effectively unbind the interviewer. Randomization is necessary to reduce confounding, since extraneous variables are also distributed equally, and so increases the probability that the observed differences are due to the intervention. Comparisons between groups are facilitated by random allocation to intervention or control groups.

External validity is low in the following circumstances; the use of controlled conditions that do not resemble common practice, where the study population is not representative of the wider population, if non-respondents differ from respondents and where there is a high degree of sample attrition which occurs with a large drop out of patients after randomization. These may be overcome by the use of less rigid inclusion criteria, a multi-centred approach and less rigorous consent procedures. Since comparison between participants and non-participants
was not undertaken and the study was conducted at a single centre, the results have low external validity and cannot be generalized to a wider setting.

5.3. Drawbacks Of Scheme.

One of the major drawbacks in implementing a similar discharge scheme routinely in hospitals is the availability of resources. Undertaking drug histories, assessing PODs, and counselling patients are all labour intensive activities. Pharmacists are a relatively expensive resource, and within hospital there may be logistic difficulties in the provision of this service. Hospital pharmacy departments in the U.K. are experiencing recruitment and retention difficulties as are being witnessed by the medical and nursing professions. Two major activities undertaken in the pharmaceutical discharge service are the drug history which took a mean 9 minutes per patient to undertake in this study and the discharge counselling which took a mean 15 minutes per patient. The time required to undertake the service is dependent upon the size of ward and the turnaround of patients. Pharmacy technicians, once adequately trained, may be able to take responsibility for the examination and reissue of suitable PODs and may have a role in patient counselling on discharge\(^{213-215}\). Another solution to providing a comprehensive service is to retain 'ward-based' pharmacists, in an attempt to shift the focus of healthcare to the patient\(^{216,217}\). This term applies to clinical pharmacists who spend the majority of their time at ward level, which enables them to undertake more activities than if their visits were limited to the traditional clinical pharmacy visit.
Throughout the study, the hospital ward pharmacist continued a twice daily clinical pharmacy service to the study wards. Since the ward pharmacist is aware of medication changes made during an inpatient as part of the prescription monitoring process, they would be in the best position to provide the patient and the GP with medicines related information. The pharmacy discharge scheme should be regarded as an extension of the clinical pharmacist's duties as opposed to a separate post-holders function.

The pharmacy discharge scheme may not be suitable for all medical patients, especially those with acute disease who were discharged on short courses of medication or no medication. The pharmacy discharge scheme did not eliminate errors, since they still occurred in three intervention patients. This suggests that communication of information is one aspect of the total medication process. Binyon has reported irrational changes to medication after discharge despite implementation of pharmaceutical plan (201). Duggan and Bates have explored patients' perceptions of their medication and their desire for information (218). They found that patients who felt confident about changes in their medication were more likely to initiate changes to their medication. The patients in my study who admitted changing their medication gave reasons which seemed reasonable to them, which suggests that they did so as a result of active decision making. Since patients choose to take or not to take their medication in accordance with the prescribed directions for a wide variety of reasons, providing patients with supplementary verbal and written information cannot lead 100% adherence to medication.
5.4. Development Of The Service.

Future development of the pharmaceutical discharge service should consider the current climate within the health care service and the pharmacy profession. Firstly, there are several forces for change in health care profession in the U.K. centered around healthcare reforms which provide opportunities for the pharmacy profession, and these will be considered. Secondly, within the pharmacy profession there have been developments such as the recognition by the Royal Pharmaceutical Society\(^{114}\) for the need for closer collaboration between hospital and community pharmacists when vulnerable patients are moving between primary and secondary care and the increasing number of pharmacists working within GP surgeries which warrant discussion in conjunction with the NHS forms.

The healthcare reforms have been led by the publication of the white paper ‘The New NHS – Modern, Dependable’\(^{219}\). Its objectives were stated were proving patients care by modernizing the NHS and delivering improved quality and efficiency. Community changes concentrated on abolishing GP fundholding and creating Primary Care Groups (PCGs) which would representative of all GP practices and commission and monitor health services for the local population. A major change to hospital trusts were that the Chief Executive of the NHS Trusts were to be the accountable officer for the quality of the service provided, where previously they were only financially accountable. Clinical governance was envisaged as a quality initiative. Clinical governance is a quality improvement process whereby good practice systematically disseminated and adverse events detected, openly investigated and lessons learnt. It demands closer clinician involvement in management decisions and scrutinises and deals with poor clinical
performance. 'The NHS plan: a plan for investment, a plan for reform' and 'Pharmacy in the future: implementing the NHS plan - a programme for pharmacy in the National Health Service', are two significant documents issued in June and September 2000 by the government. The NHS plan states the government's commitment to increasing the NHS budget, increasing staff in the NHS and introduction on electronic patient held records and electronic prescribing. There are three main themes in the NHS plan, better access to services, redesigning services around the needs of patients and ensuring high quality services. Key elements of the pharmacy plan include pharmacist prescribing, medicines management and the introduction of electronic prescribing. Opportunities for development of services at the primary care interface are roles as 'supplementary' prescribers as outlined in the 'Crown' report, with the potential to take full responsibility for prescribing discharge and informing GPs and community pharmacists. The work of pharmacists on admissions wards and the self-administration of medicines by patients in hospitals are highlighted. The NHS and pharmacy plans have paved the way for implementation of proposed models for hospital and community pharmacy, where it is considered that the focus of pharmacy services needs to shift from a drug orientated to a patient orientated role. Hence, clinical pharmacists may provide a pharmaceutical discharge service as part of the routine service to wards.

A review undertaken in 1995 identified twenty one priority areas for research related to primary/secondary interface issues. Two of the top priorities were the transfer of information across the interface and prescribing across the interface, both of which are areas where pharmacists can contribute to and extend
their role. In light of these developments within the NHS, it would appear that initiatives that aim to improve the quality of healthcare services provided to patients are encouraged. However, the efficiency of these interventions also needs to be considered.

A Government review of the prescribing, supply and administration of medicines examined the roles of the health care professionals and recommended that new groups of professionals including pharmacists be allowed to have ‘prescribing authority’ in certain areas (222). A working party entitled ‘Hospital doctors under pressure – new roles for health care workforce’ on the conducted by the Royal College of Physicians focused attention on the increasing workload facing all doctors in hospitals (225). They recommended a radical review of the work undertaken by doctors and other health care workers. They started that ‘the roles of pharmacists could also be extended to take on some of the work doctors. This would be in keeping with their desire to take on an extended clinical role for which they are now being trained.’ They acknowledged that hospital pharmacy is experiencing recruitment and retention difficulties.

There a trend towards pharmacists working with general practitioners in a similar role to hospital clinical pharmacists. Review of GP drug budgets was the major factor enabling pharmacists to work within GP practices. Various titles such as General Practice Pharmacist Specialist (226), primary care pharmacist, practice pharmacist and interface pharmacist are used to describe these posts, and duties include analysis of PACT data, development of guidelines and formularies and repeat prescription review. Other functions might include collaborating with
hospital pharmacists on interface issues. Randles and Black investigated the extent of unintended discrepancies to discharge medication in one general practice and whether a practice based pharmacist could influence this by processing hospital discharge notes (227). They reported 45% of drugs prescribed six weeks after discharge varied from the hospital discharge prescription, in a retrospective part of the study. When the practice pharmacist standardised the information on discharge medicines and sent a letter explaining changes to patients, the prevalence of unintended discrepancies was reduced to 18% of the total drugs prescribed (p=0.05). Assessment of all medicines related communication received from hospitals is already being undertaken routinely by some practice pharmacists (226).

Future development of the pharmaceutical discharge service falls into three areas which relate to the process of information transfer at the interface. At it's most simple, this process comprises of four key elements that need to be considered when patients move from primary to secondary care and from secondary to primary care. The four elements are the health care professional sending the information, the format and content of the information, the method of delivery of the information and the recipient of the information. The health care professional who arranged for the transfer of medication related information in the study was the research pharmacist, although it is considered that this activity should be the responsibility of the clinical pharmacist providing care for the patient. Since the Crown report has advocated development of health care workers roles, it may be possible for the clinical pharmacist to assume responsibility for prescribing discharge medication in the role of dependant prescriber. Due to constraints on the availability of pharmacists, many of the functions of the pharmacist providing
a pharmaceutical discharge service could be undertaken by suitably accredited pharmacy technicians. Pharmacy technicians have already taken on responsibility for POD schemes and patient medication counselling.

Content/format

The content of information provided depends on the recipient of the information, and patients may require different information than GPs or community pharmacists. Information on drug therapy has been considered to be the most important item contained in a discharge summary by GPs, hospital consultants and junior doctors (228). Information on discharge medication that GPs request include reasons for drug therapy changes and it has been determined that such information was desired by 96% of GPs and 94% of community pharmacists (76). It is possible to provide primary care professionals with more detailed information on medication regarded reasons for changing therapy, monitoring and length of treatment if pharmaceutical care plans or similar documentation are adopted. General practitioners requested information on duration of anticoagulant treatment and the length of treatment and although this information is contained in the British National Formulary, individualization of treatment plans may be required. Locally agreed guidelines would facilitate individual communications.

Information leaflets on individual drugs increase patients knowledge and satisfaction with medication and industry produced patient information leaflets, where they are produced are now required by European law to be given to patients receiving medication (86). There is some evidence that industry produced leaflets are not available for all drugs and that only minority of patients will read the
An individual patient's needs should be considered when providing information, since not all patients welcome additional information. It is appropriate to determine whether the patient has a communication disability such as blind or partially sighted, hearing impaired or unable to read and understand English. Where a sizeable proportion of the population are from ethnic minorities and are unable to communicate in English, suitable facilities for provision of information should be considered.

**Delivery/Access of records.**

Since the patient is the focus of any intervention, it may be appropriate for patients to hold their own records. A Royal Pharmaceutical Working Party recommended that 'client held documentation relevant to inpatient treatment and discharge be developed and introduced by hospital pharmacists for the benefits of clients and carers.

Information technology systems can be potential beneficial in providing, easier generation of the discharge summary for the patient. Use of information technology such as electronic mail, the internet and electronic data interchange within the NHS for drug prescriptions, transfer of information and record keeping is currently a subject of great interest, and now part of the NHS plan. NHSnet is an exclusive national network being developed for use within the NHS and will enable GPs, health authorities, NHS Trusts to exchange data and information electronically. The potential for electronic records to replace paper-based records would enable faster access to more accurate data. Other benefits of computer
based records include assured legibility, flexible layout and assisted search capabilities enabling professionals find a specific item of data. The disadvantages are not inconsiderable and such systems require structured, coded data which may limit clinical interpretation, are reliant upon hardware and software which may break down or be prone to errors and the costs include acquisition of the systems, training, maintenance and updating the system. While the NHSnet is being piloted, existing hospital pharmacy computer systems could be adapted to produce information on discharge medication for individual patients and primary care workers. Fast access to accurate information on particular patients previous and current drug history is more important if other health care professionals such as nurses and pharmacists are allowed to prescribe in addition to GPs and hospital doctors.

Recipient

The recipient of the information may be a healthcare worker such as the GP, community pharmacist or community nurse or the patient or their carer. In this study, the pharmacist was not provided with any information on the patient’s drug therapy. The Department of Health states that ‘There should be liaison between the transferring hospital and community pharmacist to ensure continuity of the supply of the drug.’ (203) Duggan and workers found that sending the community pharmacist a copy of the discharge summary reduces discrepancies in medication supplies from 53% to 32% (232). There is no reason why the medicines discharge letter could not be posted to the community pharmacist nominated by the patient or made available to the patient. As mentioned earlier, pharmacists working
directly in GP surgeries may be ideally placed to receive information on discharge medication, and conversely to provide information on admitting drug history.

In this study, medical patients were followed up. Elderly patients may be at a greater risk for medication errors. Pharmacy discharge planning has been reported to reduce medication problems in psychiatric patients discharged from acute psychiatric wards (233), although supporting statistical testing was not undertaken. Other groups such as paediatric patients and patients on complex drug regimens may benefit from pharmaceutical discharge service.

5.5. Further Research.

Medication discrepancies may result from poor or inadequate communication. Therefore, to identify discrepancies and evaluate measures to reduce discrepancies, examination of information pathways between hospital and community is necessary. There are two main drug information pathways when patients are admitted to and discharged from hospital. On admission there is patient-hospital doctor communication where the clerking process undertaken by a doctor when admitting the patients includes a drug history and a GP- hospital doctor communication in the form of a referral letter if the patient was referred to hospital by their GP. On discharge, hospital doctor-patient communication is generally in the form of a written discharge letter/summary which contains a list of discharge drugs.
In the study, there were two additional pathways for intervention patients. On admission patient pharmacist communication occurred when a drug history is undertaken by the research pharmacist and GP-pharmacist communication by telephone if necessary to supplement drug history. On discharge, Pharmacist-patient communication via a verbal counselling session and written information and Pharmacist-GP communication in the form of a printed pharmacy letter detailing medication changes. In reality are other information pathways. Patients often visit their GP after discharge and another information pathway outside the hospital is patient to GP. It is important to note that the above definitions relate specifically to errors due to communication inconsistencies between primary and secondary care. Medication errors result from non-adherence with medication, which may be influenced by a number of factors, and from poor communication. This study focused on communication issues but it is acknowledged that the provision of information does not necessarily lead to 100% adherence with medication since 3% of intervention patients admitted non-adherence. Despite this, the contribution of the health care systems to how patients take their medication should not be overlooked.

One dilemma identified in this research results from attempts to determine the ‘truth’ as applied to medication errors. For example, a patient is admitted to hospital and is prescribed a drug by their GP prior admission. The patient has not been taking the drug, although the GP is unaware of this. The scenario is not unusual, and the difficulty arises when one attempt to classify the error, and since the truth or reality is that the patient is not taking the drug, does that imply that the GP is erroneous? This research attempted to determine reality, i.e. what happened
to the patient. One case example occurred at Mount Vernon hospital where a GP complained about an inaccurate pharmacy medicines letter, since he understood the patient to be prescribed some drugs which were not identified on the pharmacy medicines letter. On the admission drug history interview, the patient had given no indication that they were taking these drugs, so it can be summarised that the patient was lying, forgot to tell the pharmacist or were not actually taking the drug. Since the latter was assumed the pharmacy discharge letter was accurate in that it reflected what the patient's circumstances. It is essential that research into disparities between what patients are doing with their medication (reality) and what GPs think they are doing (theory/ideality) is conducted and standard terminology of medication errors when applied to prescribing at the interface is developed. Subsequent research would then use this as a framework and different approaches to reducing errors could be compared.

Since the research into the pharmaceutical discharge service did not determine the effects of the pharmaceutical discharge service on delays in patient discharge from hospital and readmissions to hospital, future studies could address these questions. Factors which contribute to readmissions to hospital for elderly patients include medication changes made in hospital and the number of drugs prescribed on admission (234). Al Rashed has demonstrated that intensive discharge planning in the form of counselling, provision of a reminder card and a medicines summary can reduce readmissions in addition to improving adherence and knowledge (235).

In addition to evaluating the effectiveness of health care interventions it is necessary to identify the associated costs and determine the cost-effectiveness of
interventions. Economic evaluation is the term used to describe cost-effectiveness studies, and economic evaluation is increasingly valued in view of the necessity of providing health care where resources are finite and difficult decisions need to be made. A full economic evaluation of the pharmacy discharge scheme is desirable.

Many different professionals contribute to health care and the degree of integration varies from hierarchical model in which one decisions maker giving orders to other workers, to a team model where decisions are made following open and equal discussion (Blane D. 1997. Health Professionals in Sociology as applied to Medicine). Research into how health care professionals, in particular doctors, view the extension of the clinical understanding of professionals roles will facilitate effective communication. There is evidence that there is support for extending pharmacists roles from health care managers and clinicians.

Conclusion

This research arose from a practical need to resolve problems associated with discharge of patients from hospitals in West Hertfordshire, and the problems identified may be experienced elsewhere. In conclusion, the evidence from this study suggests that a pharmaceutical discharge service reduces errors in medication, reduces wastage of drugs and reduces problems that patients identify with their medication when medical patients are discharged from hospital. These findings suggest that the relationship between information/communication and the occurrence of medication errors is complex, and that future research should consider an economic evaluation of the pharmacy discharge scheme and the
interaction between the patient and the healthcare system. Pharmacists are now in a position to extend their roles and responsibilities within the primary/secondary care interface, due to evidence that their roles make a positive contribution to patient care alongside developments in healthcare provision and growing recognition and acceptance of extension of pharmacist’s roles. This depends ultimately upon securing financial support for the provision of services for which evidence exists that there are clear benefits for patients and health care professional alike.
CHAPTER SIX. REFERENCES.


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Dear General Practitioner,

RE: 'PATIENT NAME'
Hospital No:

Your patient was discharged from the care of Dr 'CONSULTANT' on 'WARD' ward. As part of a project into the seamless provision of pharmaceutical services I enclose the following information which I trust you will find useful.

Yours sincerely,

<table>
<thead>
<tr>
<th>Drugs/doses on admission which were continued on discharge</th>
<th>Dose</th>
<th>Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drugs/doses on admission which were stopped on discharge</th>
<th>Dose</th>
<th>Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEW Drugs/doses on discharge</th>
<th>Dose</th>
<th>Directions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

First copy: Retained in pharmacy
Second copy: Sent to GP with discharge summary
Third copy: Retained in correspondence section of notes
Appendix 2

MOUNT VERNON HOSPITAL MEDICAL DIRECTORATE/PHARMACY
ORDER FORM FOR DISCHARGE DRUGS

REGULAR drugs to be supplied as specified on inpatient chart

(Affix patient computer label here)

Exceptions:

Patients Name
Address

Additions:

D.O.B.

Consultant...........................................Ward:........................

Doctor's signature:......................................................Date:..................

Pharmacist's signature:...........................................Date:..................

Notes: 7 days supply of TTA’s will be dispensed unless otherwise requested.

For antibiotics and short courses please specify duration of therapy.
For P.R.N medication, please specify dose instructions and maximum frequency.
CDs must be written out in full on a standard discharge letter by the doctor.
Please leave drug chart on ward for pharmacist to initiate supply.

Should any problems arise, please contact Tess Dawoud, clinical pharmacist on bleep 582

MOUNT VERNON HOSPITAL MEDICAL DIRECTORATE/PHARMACY
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Please leave drug chart on ward for pharmacist to initiate supply.

Should any problems arise, please contact Tess Dawoud, clinical pharmacist on bleep 582
### PATIENT DETAILS: SECTION 1

**Drug name, form and strength**

**Dose instructions and source**

**Visual Inspection**

<table>
<thead>
<tr>
<th>Label</th>
<th>Quantity</th>
<th>Pass/Fail</th>
<th>Continued</th>
<th>Cost saving</th>
</tr>
</thead>
</table>

**GP:**

**Consultant:**

**Ward:**

**Date of admission:**

**Date of discharge:**

**p.c.**

**PMH/SH:**

**NEW DRUGS ON DISCHARGE: SECTION 3**

**Pharmacists signature**

**Transcription check**

### DRUGS ON ADMISSION: SECTION 2

**Pharmacists signature**

**Drug**

**Dx/Tx:**

**Allergies**

**Tick here if child resistant containers are NOT required:**

---

**Appendix 3 (Page 1 of 2)**
<table>
<thead>
<tr>
<th>ATIENT ADMISSION INTERVIEW: SECTION 4</th>
<th>PATIENT DISCHARGE COUNSELLING SESSION : SECTION 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>current prescribed medication (brought into hospital and at home)</td>
<td>Counselling areas:</td>
</tr>
<tr>
<td>TIC medication:</td>
<td></td>
</tr>
<tr>
<td>245</td>
<td></td>
</tr>
<tr>
<td>recently discontinued medication</td>
<td>Reminder chart given:</td>
</tr>
<tr>
<td>Allergies to drugs, foods and misc:</td>
<td>Problems:</td>
</tr>
<tr>
<td>problems:</td>
<td></td>
</tr>
<tr>
<td>time taken (no of minutes)</td>
<td>Time taken (in minutes)</td>
</tr>
</tbody>
</table>
Appendix 4
Mount Vernon Hospital Pharmacy Dept
Questionnaire for General Practitioners

(Please tick the appropriate box)

1. How useful do you find the discharge letter sent by the pharmacist in terms of the information it carries?

   Very useful
   [ ]

   Useful
   [ ]

   Not useful
   [ ]

2. Is there any other information that you would like to see on the pharmacy discharge letter, including any of the following?

   Allergies/adverse drug reactions
   whilst in hospital
   [ ]

   Therapeutic drug monitoring results
   [ ]

   Other (Please specify)
   .................................................................................................................................
   .................................................................................................................................

3. Do you receive hospital discharge information in sufficient time to review patients medication requirements?

   YES [ ]

   NO [ ]

   If not, what improvements do you feel could be made regarding the transfer of this information?
   .................................................................................................................................
   .................................................................................................................................

4. Do you have any other comments or suggestions regarding the pharmacy discharge planning process?

   .................................................................................................................................
   .................................................................................................................................

5. Would you like to continue receiving the pharmacy discharge letter in the future?

   YES [ ]

   NO [ ]

Thank you for your assistance in completing this questionnaire.
PHARMACY DISCHARGE PLANNING STUDY
QUESTIONNAIRE FOR MEDICAL STAFF

(Please tick the appropriate box)

1. Please indicate your grade:
   Registrar  □  House officer  □

2. How many discharge summaries do you write in one week:
   < 1  □
   1 - 5  □
   5 - 10  □

3. How long does it take you, on average to arrange discharge drugs, including writing up the discharge medication on the TTA sheet
   < 1 min  □
   1-5 min  □
   5-10min  □

4. Do you find that it saves you time when ordering the drugs separately, and if so, how long per patient
   No  □
   Yes  < 1 min  □
        1-5 min  □
        5-10 min  □
        > 10 min  □

5. How useful do you find the study method of ordering discharge medication, i.e. using the form attached to the drug sheet
   Very easy  □
   Easy  □
   Not easy  □
6. What problems have you encountered with the new system of ordering TTA drugs and what improvements do you feel could be made to overcome these problems?

........................................................................................................................................
........................................................................................................................................
........................................................................................................................................

7. How useful do you find the drugs on discharge letter in terms of the information it carries?

Very useful
Useful
Not useful

8. Is there any information that you would like to see on the GP letter, and if so, which if any of the following

Patient drug allergies/
adverse drug reactions whilst in hospital
Therapeutic drug monitoring results
Other, please specify...........................................................................................................
........................................................................................................................................

9. Would you prefer to continue using the new pharmacy medication discharge planning method?

Yes
No

Thank you for your co-operation and assistance during the course of this study.

Please return all completed questionnaires to Tess.
### Other medications - only when needed

<table>
<thead>
<tr>
<th>Name of medication</th>
<th>When and how to take</th>
<th>Reason for taking</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>249</td>
<td></td>
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</tr>
</tbody>
</table>

### General information

**Remember**

- Keep all your medication out of reach of children.
- Take each medication as directed on the label. If a medication causes unpleasant or unwanted side-effects contact your doctor.
- Get a repeat prescription from your G.P. before your supply runs out.
- Return unwanted medication to a pharmacy for disposal.
- For more information contact your G.P. or local community pharmacist.
- If you are buying medicines tell the chemist of any other medication you are on.

### Watford General Hospital

**Medication Reminder Card**

Please take this card with you to your Doctor and Chemist when you need more medication.

<table>
<thead>
<tr>
<th>Name</th>
</tr>
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<table>
<thead>
<tr>
<th>Address</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hospital Number</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>G.P</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pharmacist counselling by</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Date of counselling</th>
</tr>
</thead>
</table>
**How to use this chart**

- This chart shows you when to take your medication.

- At each mealtime look down the columns to see what you need to take *with or just after* the meal. Do the same about half an hour before bedtime.

- A **spoonful** means a 5ml plastic medicine spoonful.

- Medication which you take only when you need it is not included on the chart, but written overleaf.

<table>
<thead>
<tr>
<th>Name of medication</th>
<th>TIME OF DAY</th>
<th>Reason for taking medicine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Breakfast</td>
<td>Lunch-time</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
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<td></td>
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</tr>
</tbody>
</table>
Dear Dr.

Supplies of medication, as shown on the copy prescription form, were supplied to our patient when discharged on ..............................................
from the in-patient care of ..............................................................

<table>
<thead>
<tr>
<th>DISCHARGE DRUGS</th>
<th>DOSE</th>
<th>FREQUENCY</th>
<th>ROUTE</th>
<th>QUANTITY/DURATION</th>
<th>PHARM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**DIAGNOSIS**

**RECOMMENDATION/REASON FOR AMENDED THERAPY**

**FOLLOW UP ARRANGEMENTS**

- Outpatient appointment: Yes/No
- District Nurse Support requested: Yes/No
- Physiotherapy: Yes/No
- Occupational Therapy: Yes/No

Social Services:
- Day Centre/DCA/Home Help/Meals on Wheels: Yes/No
- Social Worker — Hospital or Community based: Yes/No

Summary of the patient's notes will follow.

Date: Signed

House Physician/Surgeon

Affix addressograph here

Orange Medication Record Book: Yes/No

251
PROTOCOL FOR PHARMACY DISCHARGE SCHEME

Submitted by Tess Dawoud, Pharmacist, Mount Vernon Hospital

Objectives

A controlled clinical trial of a pharmacy discharge scheme to a medical ward at Watford General hospital.

Background

There have been several problems associated with continuity of care at the primary-secondary care interface.

I have developed a scheme at Mount Vernon hospital in which a pharmacist on the medical unit has a role in discharge planning incorporating 'Pharmacy Discharge'. The pharmacist conducts a medication interview on admission, organises discharge medication, utilises patients own drugs and informs patients and their GPs of discharge therapy. This has been successfully piloted and currently all patients on the medical wards are assessed on admission and their pharmaceutical discharge planned by one of the two pharmacists covering the medical unit and to date in excess of one thousand patients have been seen. A survey of GPs and hospital medical staff has resulted in an overwhelming vote of support for the system and requests for it to be extended. It now hoped to assess the scheme in a controlled clinical trial.

Method

The study pharmacist (hereafter referred to as the pharmacist) will visit two medical wards namely Heronsgate and Aldenham wards at Watford General hospital. All medical admissions will be recorded by the pharmacist after consulting with nursing or clerical staff. Patients will then be randomly selected for inclusion in the trial. Inclusion criteria are medical patients discharged to South Hertfordshire Health Agency, who will be responsible for taking their own medication. Patients transferred to other hospitals, nursing homes or areas outside the boundaries of these health agencies will not be included. Exclusion criteria are also patients who are confused, transferred to another hospital/speciality, discharged on no medication and for whom discharge was not planned. From data collected at Mount Vernon hospital it is envisaged that approximately 80% of total discharges would meet the inclusion criteria. As soon as possible after admission, i.e. the same or following day, patients selected for the trial will be visited by the study pharmacist and their consent sought before continuing. Their presenting complaint and other relevant details will be gathered from the notes and an interview undertaken.
at the patient's bedside at a mutually convenient time. The patient will be asked about any medication they are currently taking, both prescribed and purchased, recent changes to drug therapy and any allergies or adverse drug reactions they may have experienced in the past. If any inconsistencies are found between the pharmacist acquired drug history and the drug history given in the medical notes, or on the drug chart the medical team will be notified. Patients preferences for containers and closures will also be noted. Patients will be asked to have their medication brought in from home if they had already not done so on admission. The medication will remain the patient's property and current hospital policy will be followed. All medication brought in will be assessed for suitability for extended issue and stored within the hospital ward in a locked cupboard until patient is discharged.

An order form for discharge medication (see appendix I) and a trial identification sticker will be attached to their drug chart by the pharmacist. Prior to discharge, the doctor will sign the order form for discharge medication instead of writing the discharge medication on the standard discharge letter. The remainder of the discharge letter will be completed by the doctor. All medication the patient was having as an inpatient will be supplied unless otherwise indicated on the order form. If an 'as required' medication is needed this may be added to the additions section of the order form. Preparations that are subject to the prescription requirements of the Misuse of Drugs Regulations 1985, i.e. controlled drugs must be ordered separately by the doctor in the usual manner. The pharmacist will be notified of the planned discharge by medical or nursing staff and will then determine what medication the patient requires. Suitable patients own drugs will be reissued and any remaining items ordered and a fourteen day supply dispensed by the hospital pharmacy. The patient will receive verbal counselling on their discharge medication by the pharmacist and written information in the form of a drug list or reminder chart. A drug list will be issued to all patients unless they are on more than 4 items or have had several changes made to their drugs on admission or request a chart. In these cases a reminder chart will be issued. The GP will be notified of medication in a detailed letter (see appendix II). A follow-up visit will be made three weeks post discharge. The remainder of patients will undergo the discharge process as per current hospital policy and no intervention by the study pharmacist will be made. A random sample of these control patients discharged from the medical ward will be seen on discharge and their permission sought for an interview three weeks post-discharge.

The following factors will be assessed:

- Compliance

This will be assessed during the home visit. A questionnaire has been drafted and includes self assessment of compliance, and discrepancies (intentional/unintentional) between current and discharge medication.
Appendix 8 (Page 3 of 3)

*Satisfaction*

Patient satisfaction will be assessed during the home visit. Postal
questionnaires will be sent to patients GPs twenty-one days after discharge.
Medical and nursing staff on the trial and control wards will also be surveyed.

*Economic factors*

This will include a measurement of dispensary workload. The time taken
for the discharge medication to be dispensed and checked will be measured by
direct observation for a proportion of both the intervention group and the
control group. The number and type of dispensary interventions will also be
documented. Doctors/nursing/pharmacists time spent on discharge medication
will be measured by direct observation. The costs of drugs dispensed/reissued
and the amount of discharge medication dispensed will also be determined.

There were 479 acute medical discharges (consultant finished episodes)
from Watford General hospital during April 1995, if the estimated 80% of these
meet the inclusion criteria, it is assumed that 380 patients will be eligible for
the trial each month. Approximately 1 in 10 patients will be selected, half
receiving the pharmacy package and the other half standard discharge. We
estimate one hundred and twenty patients need to be visited at home. This is
based on the assumption that 80% of discharge medication is associated with
discrepancies. This number of patients would detect a reduction from 80% to
50 % with a power of 90% and alpha = 0.05 and assuming a 10% dropout rate.
Appendix 9

MOUNT VERNON & WATFORD HOSPITALS
N.H.S. TRUST

AGREEMENT TO PARTICIPATE IN RESEARCH PROJECT

Title of Project

I voluntarily consent to take part (or give consent that my child/ward may take part) in this research project. I understand my legal rights are not affected by giving this consent.

I confirm that I have read and understood the information describing this project and all my questions have been answered to my satisfaction. I also understand that I may withdraw from the project at any time if I find that I am unable to continue for any reason and that if I do so, it will not adversely affect my future medical care.

I understand that I am entitled to receive a signed copy of this form.

Signed

Witness

Investigator's Statement

I have explained the nature, demands and foreseeable risks of the above research to the subject.

Signature

vu/agree 19.2.95
Appendix 10

Pharmacy Discharge Project
Patient Information Sheet

I am reviewing the methods we use in the hospital to provide information about your medication to you and your GP.

I would be grateful if you would help me by taking part in this project.

If you agree, I would like to visit you at home, about three weeks after you leave hospital to find out how you are managing with your medication. This would take about one hour and would involve me asking you some questions and looking at the medication you are taking or using.

I would also like to contact your GP to check that the information they got on your medication was useful. I may also need to look at your medical notes.

You can be assured that all information obtained will be dealt with confidentially.

If you do not wish to take part in this project you are not obliged to and this will not affect your treatment in hospital. If you agree but wish to withdraw you may do so at any time and this also will not affect your future treatment.

Thank you for your time

Tess Ditta

Project Pharmacist
Interview Schedule for Discharge Planning Scheme

Research Pharmacist: Tess Ditta

CONFIDENTIAL Background Data
(Data to be obtained prior to/upon discharge)

Section 1: Patient Details

<table>
<thead>
<tr>
<th>Patient Number:</th>
<th></th>
<th>Trial / Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Name:</td>
<td></td>
<td>Date of Birth:</td>
</tr>
<tr>
<td>Home Address:</td>
<td></td>
<td>Gender: M / F</td>
</tr>
<tr>
<td>Tel No:</td>
<td></td>
<td>Address and tel no. of interview if different from home address:</td>
</tr>
</tbody>
</table>

Section 2: GP Details

<table>
<thead>
<tr>
<th>GP Name:</th>
<th></th>
<th>Tel No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td></td>
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</table>

Section 3: Admission Details

<table>
<thead>
<tr>
<th>Date of Admission:</th>
<th>Date of Discharge:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consultant Name:</td>
<td>Ward Name:</td>
</tr>
<tr>
<td>Discharge medication information: given to patient / posted to GP</td>
<td></td>
</tr>
</tbody>
</table>

Section 4: Medical Details

<table>
<thead>
<tr>
<th>Presenting complaint:</th>
<th>Diagnosis and treatment:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Previous Medical History:</td>
<td></td>
</tr>
</tbody>
</table>

Section 5: Social Details

| Social Status: Living alone / living with someone else |
| Circle if patient receiving at home: |
| MOW | Home Help | District Nurse |

Section 6: Interview Details

| Written Consent sought Yes / No { if No, do not continue } |
| If interview not undertaken reason why: |
| GP Questionnaire 2 sent Yes / No { if No, send by day of interview } |
| Date GP questionnaire 2 sent |
| Date of Interview: | Time Of Interview: |
| Interview confirmed Yes / No Date of Confirmation |
| Patient been readmitted Yes / No { if Yes, do not undertake interview } |

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# Drug Data

## Section 7: Drug Details on Admission

<table>
<thead>
<tr>
<th>Name, strength and form of Drug</th>
<th>Dose</th>
<th>Directions</th>
<th>Comments</th>
<th>Continued on Discharge</th>
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<tbody>
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</tbody>
</table>

## Section 8: Drug Details On Discharge

<table>
<thead>
<tr>
<th>Name, strength and form of Drug</th>
<th>Dose</th>
<th>Directions</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

## Section 9: Drug Summary

<table>
<thead>
<tr>
<th>No. drugs on admission</th>
<th>No. drugs on discharge</th>
<th>No. dose changes made</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>No. drugs stopped by discharge</th>
<th>No. drugs started by discharge</th>
<th>Counselling by:</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>
Interview

Introduce self, remind patient of study and request permission for interview, state approx length of interview and that information supplied is confidential {Circle answers as appropriate}

| Note the time: |  |
| Is the patient responding to questions? | No | Yes |

If no, specify who is answering

- Spouse
- Other Relative (state who)
- Other (state who)

Q1 I understand you're taking regular medication
Does anyone usually help you with any of your medication?

Yes (go to Q2) No (go to Q3)

Q2 May I ask who that is? Spouse/Partner
Other relative
Home Help
District Nurse
Other (state who)

Q3 How do you remember to take your medication? (prompts)

- Medication aids
- Printed/written list
- Other

Q4 Can you tell me more about what you do?
Q5 When you were discharged from the medical ward, can you tell me who gave you your medication to take home? (Don’t worry if you can’t remember)

- Doctor
- Nurse
- Pharmacist
- Don’t know / can’t remember
- Other (state who)

Q6 Did anyone talk to you about your medication before you were discharged?

- Yes (go to Q7)
- No (go to Q11)
- Can’t remember (go to Q11)

Q7 Who was it?

(tick one or more)
- Doctor
- Nurse
- Hospital pharmacist
- Study pharmacist
- Other (state who)

Q8 Do you think the information has helped you in any way?

- Yes (go to Q9)
- No (go to Q10)
- Can’t say (go to Q11)

Q9 If so, in what way?
(probe helpful versus useful)

Q10 Can you tell me why not?
Q11 Did you get any written information such as leaflets or cards from hospital about your medication?

Yes (go to Q12)  No (go to Q20)  Can’t remember (go to Q20)

Q12 Do you still have it?

Yes (go to Q13)  No (go to Q14)

Q13 May I see it please?

(enter type of info)  Patient reminder chart  Anticoag card  other

Q14 Has it been of any use to you?

Yes (go to Q15)  No (go to Q16)

Q15 In what way (how have you used it)?

Q16 Why was that (probe)?

Q17 Have you shown it to anyone since you were discharged?

Yes (go to Q18)  No (go to Q19)

Q18 Who have you shown it to?

GP  Community pharmacist  Other (state who)...........................

Q19 How often have you used it since you were discharged?

Once a day  At all drug times  Initially when left hospital only
<table>
<thead>
<tr>
<th>Q20</th>
<th>Have you had any problems with your medication since you left hospital?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>(go to Q21)</td>
</tr>
<tr>
<td>No</td>
<td>(go to Q22)</td>
</tr>
</tbody>
</table>

| Q21 | Can you tell me more about it?                                      |

<table>
<thead>
<tr>
<th>Q22</th>
<th>Were there any questions you would have liked answered before leaving hospital?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>(go to Q23)</td>
</tr>
<tr>
<td>No</td>
<td>(go to Q24)</td>
</tr>
</tbody>
</table>

| Q23 | Can you tell me more about it?                                             |
Could you get all the medication that you take or use regularly out for me.

Q24 Have you been back to the hospital to see a doctor since you were discharged?
   Yes (go to Q25)   No (go to Q30)

Q26 Can you tell me why?

Q27 How often have you been back?

Q28 Did you get a prescription from the hospital?
   Yes (go to Q29)   No (go to Q30)

Q29 Can you tell me what it was?

Q30 Have you contacted or visited your GP’s surgery since you were discharged?
   Yes (go to Q31)   No (go to Q34)

Q31 How did you get in touch with your GP?
   probe for personal visit/telephone/gp visit patient

Q32 Who did you speak to?

Q33 Can you tell me why you went to see them,
   (tick one or more)
   To drop off hospital discharge letter (note date)
   To get a further prescription
   To see GP on a non-admission related problem
   To see GP on an admission-related problem
   Other (state what)
Appendix 11 (Page 8 of 11)

Q34  When most patients leave hospital, they’re given a supply of medication, did that happen to you?

Q35  Have you run out of any of it yet?

Q36  Have you got a new supply of medication?

Q37  Can you tell me where you your new supply from?

Q38  Have you bought any medication or remedies, from a chemist or shop or alternative practitioner since you were discharged?

   Yes (note whether purchased overleaf)   No (go to Q39)
Q39 Now I'd like to go through all your medication with you.

(For each medication, document the name, strength and form of drug, the directions on the label, the place dispensed i.e. hospital or community pharmacy (H/C), and the date dispensed in the table below)

(For each oral drug) Can you tell me what you take this for and how often you take it?

(For each topical prep) Can you tell me what you use this for and how often you use it?

(For each container/closure) Do you have any problems opening this container?

<table>
<thead>
<tr>
<th>Name, strength and form of drug</th>
<th>Directions on label</th>
<th>Where dispensed H/C or if bought</th>
<th>Date Dispensed</th>
<th>Patient knows what drug is for</th>
<th>How often patient takes/uses drug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tablet bottle Ordinary Cap CRC</td>
<td>N/A</td>
<td>Not Difficult</td>
<td>Difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blister/Foil Packs</td>
<td>N/A</td>
<td>Not Difficult</td>
<td>Difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Bottles</td>
<td>N/A</td>
<td>Not Difficult</td>
<td>Difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inhaler Devices</td>
<td>N/A</td>
<td>Not Difficult</td>
<td>Difficult</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Topical preps</td>
<td>N/A</td>
<td>Not Difficult</td>
<td>Difficult</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 11 (Page 10 of 11)

Q40 Has you GP or surgery changed any of your medication in any way since you were discharged from hospital?

Yes (go to Q41)  No (go to Q42)

Q41 Can you tell me about those changes?

(For each medication change document details below and determine whether patient told reason for change)

<table>
<thead>
<tr>
<th>Name, strength and form of drug</th>
<th>Details of changes made</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<tr>
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</tbody>
</table>
Appendix 11 (Page 11 of 11)

Q42 Have you found you needed to stop or start a medication or changed a dose at all since you were discharged?

Yes  \textit{(enter details below)}

No  \textit{(prompt for known discrepancies which were not accounted for by Q41)}

<table>
<thead>
<tr>
<th>Name, strength and form of drug</th>
<th>Details of changes made</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

Q43 Is there anything you would like to ask me?

Q44 Is there anything you’d like to tell me?

Note the time

Thank you very much for your time and help.
Appendix 12
Trial of a Pharmacy Discharge Scheme at Watford General Hospital.
Confidential Questionnaire for General Practitioners

May I ask you to take two minutes to complete this questionnaire and return to the pharmacy department at Watford General Hospital in the envelope provided.

Re:
Discharged from the care of Dr [Name] on [Date] ward [Name]

The following questions relate to the information on DISCHARGE MEDICATION for this patient.

Please tick boxes where appropriate:

1. Please enter the date on which your surgery received the discharge summary

   Date: ________________________________

2. Did you receive the information on discharge information in sufficient time to initiate a further supply of your patient's medication?

   YES [ ] NO [ ]

3. Was the information on discharge information legible?

   YES [ ] NO [ ]

4. Was any necessary information on discharge medication missing?

   YES [ ] NO [ ]

   If YES please give details__________________________________________

5. Are you satisfied with the current method for sending information on discharge medication?

   YES [ ] NO [ ]

   If NO please state how you would prefer information to be sent____________________

6. Do you have any other comments or suggestions on the provision of information on discharge medication?

   __________________________________________________________________________

   Thank you for your assistance in completing this questionnaire.

gpques.doc
Appendix 13

Watford General Hospital Pharmacy Discharge Scheme
Information from General Practitioners
Confidential

Re (Patient name, address
Discharge details)

As we are endeavoring to improve the quality of discharge services, may I ask you to please provide information relating to the current drug history for the above named patient.

1. Give details of patients current drug history including names, and strengths of all drugs, dosage instructions and date of prescription supply

<table>
<thead>
<tr>
<th>Name and strength of drug</th>
<th>Dosage instructions</th>
<th>Date of prescription supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

2. Give details of any changes made to drug treatment since patient was discharged from hospital

Thank you for your assistance in providing this information.
Please return the completed form to the pharmacy department at Watford General Hospital in the stamped, addressed envelope provided.
Tess Ditta, Pharmacist - Pharmacy Discharge Scheme
Appendix 14
Pharmacy Discharge Scheme
Information for Doctors

I am undertaking a controlled trial of a pharmacy discharge scheme on the medical wards, Aldenham & Heronsgate. The trial has Ethics Committee approval and has been approved by the clinical director of medicine. The scheme should reduce junior doctors' time spent discharging a patient. Please help me evaluate it by following the procedures below.

All patients entered for the new discharge scheme will be identified by means of a peelable green sticker on their drug chart. For these patients:

**On Admission**

When clerking the patient
- Ask them if they have brought their medication with them.

  - If they have, ask patient to give to nursing staff and reassure them that their medication will be returned to them on discharge.
  - If they have not, please ask relatives or carers to bring the medication in if possible.

**On Discharge - weekdays**

- I need at least four hours notice for the scheme to work, so bleep me as soon as possible when the discharge decision is made.
- I will attach an order form for discharge medication on the drug chart.
- The order form assumes that all regular medication prescribed on the drug chart are needed on discharge. If this is not the case you need only sign and date the form.
- If you want some drugs started or stopped, enter those regular drugs you do not want the patient to be discharged on in 'exceptions' box.
- Enter those additional drugs, such as prn drugs you want the patient to be discharged on in 'addition' box.
- Sign and date the order form.
- Please leave the drug chart on the ward for me to collect.

**Notes**

- CDs cannot be ordered on this form, you need to order them on the discharge summary in the usual manner.
- You won't need to write out the drugs on the discharge letter, but you'll still have to complete the remainder of the discharge letter.
- Fourteen days supply of all drugs will be dispensed, unless otherwise requested, e.g. antibiotics. Please state the drug and the number of days supply on the exceptions box of the order form.

I will then arrange supply of medication, and counsel the patient prior to discharge. I will also produce a letter for GPs summarising the discharge medication. This will be sent to the GP with the discharge letter.

**On Discharge - weekends**

If a patient is planned for weekend discharge, please let me know by Friday. If this is not possible, don't use the order form and treat the patient as a normal discharge.

If you have any problems let me know on bleep 111 or ext 7735
Tess Ditta, Research Pharmacist - Pharmacy Discharge Scheme
Appendix 15

Pharmacy Discharge Scheme
Tess Ditta
Information for Nursing Staff

As you may be aware I am undertaking a study on the medical wards, Aldenham and Heronsgate. This handout summarises a few relevant points to help you which will ensure it runs as smoothly as possible for all concerned.

All patients entered for the study will be identified by means of a peelable green sticker on their drug chart.

On Admission

When admitting the patient onto the ward please ask them if they have brought their medication with them. If they have not, please ask relatives or carers to bring the medication in if possible. Reassure the patient that their medication will be returned to them on discharge. Drugs should be stored in the locked cupboard in the clinical room and not used routinely used during the patients stay.

On Discharge - weekdays

I will attach an order form for discharge drugs to each drug chart. However, spare forms will be kept with the TTA forms on each medical ward.

The doctors should complete and sign the order form and leave the drug chart on the ward for me to collect. This means they won’t have to write up the discharge medication on the discharge summary but they should still complete the remainder of the discharge summary for the G.P. I will organise the discharge medication from that point BUT I do need to be aware of the discharge so please bleep me when it seems likely that the patient will be discharged.

I will counsel the patient on their medication on the day of discharge, and will give them their medication if they are to be discharged shortly. If they are to be discharged later e.g. in the evening, the medication will be put in the clinical room and the nurse discharging the patient should give them their medication.

I will type out a letter for GPs giving drug details (drug summary), which will be kept in the medical notes until the patient is discharged. Can nursing staff ensure that it is sent to the GP with the discharge letter. A copy of this letter will remain in the notes.

On Discharge - weekends

If a patient is planned for weekend discharge, please let me know by Friday. If this is not possible, don’t use the order form and treat the patient as a normal discharge.

If you have any problems let me know - I’m on a long range bleep. Ring switchboard and they will bleep me.

Tess Ditta, Pharmacist - Pharmacy Discharge Scheme
Appendix 16
Pharmacy Discharge Scheme
Tess Ditta
Information For Pharmacy

As you may be aware, I am undertaking a study on the medical wards Aldenham and Heronsgate. This sheet summarises a few relevant points to help you which will ensure this run as smoothly as possible for all concerned.

All trial patients will be identified by means of a peelable green sticker on their drug chart.

On Discharge - Weekdays

I will bring down the drug chart from the ward, attached to it will be the order form for discharge medication, which will have been signed and dated by the doctor and myself. The list of drugs requiring dispensing will be written on section 3 of the Patient Drug Summary (PDS) by myself. The dispensary pharmacist should check the drug chart against the PDS as follows:

1. Check that patient name, ward and consultant on the order form and PDS are the same as that on the front of the drug chart.
2. Check that all regular items requested have either been ordered on section three of PDS or that patients own supply is to be reissued (check that drug passes visual inspection on section 2 of PDS)
3. Check that any drugs ordered on the 'additional' section of the order form are ordered on section 3 of the PDS.
4. Check that any drugs on the 'exceptions' section of the order form have not been ordered on section 3 of the PDS.
5. Fourteen days supply will be requested unless the doctor has ordered otherwise, e.g. for antibiotics
6. Controlled drugs cannot be ordered in this way, and if any CD is needed, the doctor will order this in the usual manner.

If the above checks are satisfactory, then the dispensary pharmacist should sign the PDS where indicated, and put the drug chart and order form on the shelf for return to the ward. Please label and dispense, and check in the usual manner. Once checked, please bleep me and leave the medication and PDS sheet in a bag on the shelf for me to collect. Do not send to the ward.

On Discharge - Weekends

If discharge was planned, please dispense by Friday so that I can counsel the patient. If this was not possible, please ignore the order form, and treat the patient as a normal discharge. If you have any problems, let me know - ring switchboard and they will bleep me.

Tess Ditta, Pharmacist - Pharmacy Discharge Scheme
# Appendix 17

## Timetable for Data Collection

<table>
<thead>
<tr>
<th>BLOCK IV</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Task</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admission</td>
<td>Admission (n=20)</td>
<td>Admission (n=20)</td>
<td>10 trial pts, 10 control pts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge</td>
<td>Discharge (n=10)</td>
<td>Discharge (n=10)</td>
<td>Discharge (n=10)</td>
<td>5 trial pts, 5 control pts</td>
<td>5 trial pts, 5 control pts</td>
<td>5 trial pts, 5 control pts</td>
</tr>
<tr>
<td>Followup</td>
<td>Followup (n=10)</td>
<td>Followup (n=10)</td>
<td>Followup (n=10)</td>
<td>5 trial pts, 5 control pts</td>
<td>5 trial pts, 5 control pts</td>
<td>5 trial pts, 5 control pts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Time (total 40 hr/wk)</strong></th>
<th>trial pts</th>
<th>control pts</th>
<th>trial pts</th>
<th>control pts</th>
<th>trial pts</th>
<th>control pts</th>
<th>trial pts</th>
<th>control pts</th>
<th>trial pts</th>
<th>control pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Admission</td>
<td>10 hours</td>
<td>5 hours</td>
<td>10 hours</td>
<td>5 hours</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Discharge</td>
<td>5 hours</td>
<td>-</td>
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<td>Followup</td>
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<td>-</td>
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<td>-</td>
</tr>
</tbody>
</table>

| **Total hours** | 20 hours | 20 hours | 5 hours  | 20 hours  | 20 hours  | 20 hours  | 20 hours  | 20 hours |
| **Remaining Hours** | 20 hours | 20 hours | 35 hours | 20 hours  | 20 hours  | 20 hours  | 20 hours |

| **Remaining Tasks** | ?? | Coding of results | Coding of results | Coding of results |

*Admission* - Seeking consent, medication history, interventions - assume 1 hour/trial patient 30 mins/control patient

*Discharge* - Notification of discharge, ordering TTAs and GP letter, patient counselling - assume 1 hour/trial patient nil/control patient

*Followup* - Interview patient at home, send questionnaire to GP - assume 2 hours/patient
Appendix 18. Discrepancy Flowchart

Short course or prn drug
Outside scope of study

YES

Is drug a pm, or short course

NO

YES

For all drugs seen at home visit was drug prescribed by hospital on discharge?

NO

Was drug prescribed by GP or hospital doctor?

NO

Drug is OTC purchase, Outside scope

YES

For long term, regular drugs has patient stopped drug

NO

Has patient changed dose/frequency?

NO

Has patient changed dose/frequency?

YES

Intentional change by doctor

NO

Has GP intentionally stopped drug?

YES

Is patient aware that they should be taking the drug?

NO

Was drug prescribed by GP or hospital doctor?

YES

Drug is newly prescribed by doctor

NO

Was drug a preadmission drug?

YES

Was preadmission drug intentionally stopped by hospital?

NO

Was preadmission dose/freq intentionally changed by hospital?

YES

Is patient aware of correct dose/frequency?

NO

Hospital error

YES

Did GP restart drug intentionally?

NO

GP Error

NO

Patient error.
Non adherence

NO

Was preadmission drug intentionally stopped by hospital?

YES

Is patient aware of correct dose/frequency?

NO

Hospital error

NO

Patient Error. Noncomprehension

NO

NO

YES

Intentional change by doctor