Understanding patient flow within community healthcare - a novel mapping of sequences and patterns of referral

Ryan Palmer, Martin Utley

Clinical Operational Research Unit (CORU), University College London (UCL), London
e-mail: ryan.palmer.14@ucl.ac.uk

Health Services Research UK Symposium 2017
In recent decades, an ambition of healthcare policy has been to deliver more care in the community sector [4].

- Diverse range of geographically dispersed health services
- Common for patients to use a range of services which they may re-use
- Considered to be crucial in meeting the current and future challenges that face modern health care services [3]

**Challenge:** how organise and deliver these services given: physical distribution, patients using multiple services, increased referrals, case mix, and long term care requirements [6].
Serve North East London (Waltham Forest, Redbridge, Barking and Dagenham, and Havering) serving a population of almost 2.5 million (including Essex)

They have adopted a decentralised community based model of healthcare - in accordance to national developments and changes in policy [2]

NELFT Operational Plan states that this transition followed the trend to deliver more care out of hospital [5]

Includes: provision of care for patients with long term illness, mental health services and elderly care
Purpose of work

Working with services in Havering, we analysed community referral data for patients aged 65 and over to:

- Understand the dynamics of referrals in the large and complex system of care
- Help identify whether referrals may be streamlined or simplified
- Explore how patients used multiple services and whether common referral patterns occurred

NELFT are seeking to establish a single point of access (SPA) - they wanted these insights to shape their thoughts in designing the SPA.
Visualising referral data

From meetings, three characteristics of the community referrals stood out:

- **Theoretically:** possible for all physical health services to refer to each other - complete network of more than thirty services

- **Perception:** believed this would be seen in practice

- **Key characteristic:** potential for patients to re-use services multiple times

Seeking to understand these dynamics, we produced a network to represent their data using Gephi [1].
Key features of the network

*Patient level routine data set - 1st April 2014 to 31st Aug 2016*

**Nodes:** represent services - two types

▶ Specialties: services that are part of NELFT’s community portfolio, to which patients are referred.

▶ External Sources: services that exist outside of NELFT’s community portfolio, referring patients in i.e. acute care

**Edges:** represent referrals

▶ Directed: always flowing from sources to referrals, indicated by arrows

*Note: Some specialties may refer to other specialties*
Key features of the network

- **Size:**
  - External Source: Number of referrals leaving
  - Specialty: Number of referrals received

- **Colour:**
  - External Source: White
  - Specialty: Light brown to dark
  - Indicates a measure for the service:
  - i.e. Average number of appointments per referral

![Diagram showing network with categories: Acute, GP, Podiatry, District Nursing. Source size: 1 - 12,586, Specialty size: 1 - 12,598. 1-22: Average number of appointments per referral.]
Key features of the network

- **Width:**
  - Number of referrals: 1 - 5810

- **Colour:**
  - Blue to red
  - Indicates a measure for the service:
    - i.e. Average number of referrals per patient
75 nodes:
- 44 sources, 31 specialties
  - 11 refer to other specialties
- 45,506 referrals
- 386 referral paths (edges)
- Average number of edges connecting each node - 5.147
74 nodes:
- 44 sources, 30 specialties
- 10 refer to other specialties
- 293 referral paths (edges)
- Accounts for 6.8% of all referrals
39 nodes:
- 16 sources, 23 specialties
  - 9 refer to other specialties
- 93 referral paths (edges)
- Accounts for 93.2% of all referrals
NELFT to NELFT

28 nodes:
• All specialties
  • 11 refer to other specialties
• 74 edges
• 2,919 accounting for 6.4% of all referrals
• Modularity – <0
  • No natural subgroups
Is the high number of low activity referral pathways (edges) appropriate for these services?  
- Does this highlight a flaw in the system?  
- Or, is this a positive characteristic that patients may be referred into any service?

How can should a SPA be designed to streamline referrals?

We ran a workshop with service leads to teach them how to apply these methods to their data, and interpret the results  
- Service managers began to be identify possible services for inclusion within the SPA.

- Stimulated thought around whether only referrals from external sources should be included, or whether the SPA should cover NELFT to NELFT also.
Methods for visualising referral data are useful for the management and organisation of healthcare services.

These methods:

i. Visualise complex data which would otherwise be overwhelming and hard to understand.

ii. Analyse patient activity, identifying services that exhibit interesting characteristics.

iii. Stimulate conversation around analysis or information that is beneficial in managing these services.
Future work with design of SPA

Questions raised but not investigated:

▶ Are there any regions in the system where patients bounce from one service to another and back?

▶ Can inappropriate referrals be identified i.e. short episodes that get referred on elsewhere?

▶ Can these methods be used to describe a patient’s total care by including services outside of physical community care i.e. acute care, social care and mental health?

▶ What insight may be gained by including more types of service?
[1] Bastian M, Heymann S, and Jacomy M.

Our health, our care, our say: a new direction for community.
[Online; Accessed 01 August 2015].

[3] Ham C, Dixon A, and Brooke B.
Transforming the delivery of health and social care: the case for fundamental change.

Evidence: Getting out of hospital?
2011.

[5] NELFT.
NELFT Operational Plan 14-16.

A systematic literature review of operational research methods for modelling patient flow and outcomes within community healthcare and other settings.
This research is supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care North Thames at Barts Health NHS Trust. The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health. The author is supported by the Health Foundation as part of the Improvement Science PhD programme. The Health Foundation is an independent charity committed to bringing about better health and healthcare for people in the UK.

Collaboration for Leadership in Applied Health Research and Care North Thames
http://www.clahrc-norththames.nihr.ac.uk
Thank you for your attention
Are there any questions?