

Clinical Audits/Service improvements

Prescribing in a pandemic: Electronic prescribing aids to improve non-specialist adherence to COVID-19 guidelines

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ABSTRACT

Introduction: The evidence around COVID-19 management is continuously evolving. Ensuring awareness of, and adherence to current guidance is challenging. As the second wave of COVID-19 emerged, we recognised the urgent need for better standardisation of patient care in the context of increasing patient load and acuity and the resulting redeployment of staff.

Methods: COVID-19 patients admitted to adult medical wards were identified via their positive swab results. An e-prescribing protocol which included five drugs was introduced and adherence to prescribing guidelines assessed via the electronic noting and prescribing system. Doctors' views of the prescribing protocol were assessed.

Results: Following introduction of the protocol, adherence to guidelines improved. The proportion of patients either prescribed dexamethasone or with a valid contraindication documented increased from 85% to 97% and for remdesivir this increased from 60% to 79%. There was also significant improvement in the prescription of 'as required' insulin for patients on steroids (26% to 48%) and oxygen (43% to 79%).

93% of doctors surveyed were aware of the e-prescribing protocol and 81% had used it. Confidence in adhering to the protocols increased from an average of 3.3 to 4.5 out of 5 and 93% of respondents agreed that the protocol was easy to use.

Discussion: Overall, this demonstrates that electronic prescribing protocols can be effective in increasing adherence to guidelines and doctors felt this was a useful tool. This is especially important in a pandemic situation in which many doctors were redeployed outside of their usual specialties.

Background

In the initial stages of the COVID-19 pandemic there was little evidence about effective treatment. As evidence emerged, treatment guidelines were instigated with therapeutics such as corticosteroids and antiviral agents.

After the RECOVERY trial demonstrated the utility of dexamethasone in patients with COVID-19 requiring oxygen or ventilation, and the REMAP-CAP trial similarly suggested the benefit of hydrocortisone, the National Institute for Health and Care Excellence (NICE) advised the use of corticosteroids in hospitalised COVID-19 patients ([Dexamethasone in](#)

[Hospitalized Patients with Covid-19 — Preliminary Report, 2020; The Writing Committee for the REMAP-CAP Investigators, 2020; Overview | COVID-19 rapid guideline, 2021](#)).

The use of dexamethasone created the possibility of complications, necessitating the use of further treatments such as proton pump inhibitors (PPI) as ulcer prophylaxis and insulin for hyperglycaemia, and additional organisation-wide guidance was rapidly developed and disseminated ([COVID guideline group, 2021; Paediatric Multisystem Inflammatory Syndrome –Temporally associated with SARS-CoV-2 \(PIMS-TS\): Referral pathway and clinical management guideline - GSTT guidance, 2021; Maternity COVID-19 Guidelines - GSTT guidance,](#)

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2021; Kariyawasam et al., xxxx). Furthermore, the introduction of antiviral agents such as remdesivir provoked further guidance specifying eligibility criteria and monitoring requirements (Remdesivir for Treatment of COVID-19 Infection in Adults - GSTT guidance, 2021; COVID-19 rapid evidence summary, 2021). In addition, experience with venous thromboembolism (VTE) in COVID-19, alongside evidence of reduced mortality in patients treated with higher doses of low molecular weight heparin (LMWH) led to specific recommendations surrounding VTE prophylaxis in patients with COVID-19 (Longhitano et al., 2020; Management of VTE prevention and treatment during COVID-19 pandemic - GSTT guidance, 2021; Nadkarni et al., 2020; Paolisso et al., 2020; Overview | COVID-19 rapid guideline: managing COVID-19 | Guidance | NICE [Internet]. NICE; [cited, 2021]).

The implementation of several new guidelines for the management of COVID-19 within a relatively short space of time, prior to combined NICE guidance, led to concern that during the second wave, prescribers may have difficulty applying all recommendations accurately and completely, particularly given the pressure of the increased workload and the fact that many staff had been redeployed from other areas.

An initial audit had developed and assessed a local 'COVID bundle', collating management guidance into a single place. This had shown a particular need for improvement in the prescription of oxygen, PRN Novorapid® and prophylactic PPI.

Methods:

Acutely admitted patients with a positive COVID-19 swab were identified over a 48-hour period in late December 2020 through internal reporting systems. Patients admitted to Critical Care areas within 48 h of admission, patients who were having repeat swabs done, patients admitted under other clinical directorates, and patients transferred from other hospitals were excluded.

Electronic notes and the electronic prescribing systems were used to collect data on parameters contained within the trust COVID-19 bundle for acutely admitted COVID patients:

- Documentation of an escalation plan
- Prescription of dexamethasone
- If not prescribed dexamethasone, whether a reason was documented and what this was
- If prescribed dexamethasone, whether a prophylactic PPI was prescribed
- If prescribed dexamethasone, whether PRN Novorapid® was prescribed
- Prescription of remdesivir
- If not prescribed remdesivir, whether a reason was documented and what this was
- If prescribed remdesivir, whether liver function tests (LFTs) had been ordered for the next day
- Prescription of appropriate VTE prophylaxis, and if not, whether there was a documented reason
- Prescription of oxygen
- Whether there was an oxygen requirement

Intervention:

An e-prescribing protocol was created within the existing electronic prescribing software (MedChart) in collaboration with the software team, pharmacy, the department of infection and junior doctors working both in Infectious Diseases and on the Acute Admissions Ward (AAW). This protocol was designed to allow a prescriber to select the COVID-19 orderset, and then select and prescribe medication as per the current COVID-19 guidance, with optional further medications if required (e.g. PRN Novorapid® if prescribed dexamethasone). This would replace the previous system where a prescriber would type in, select and dose each

Table 1

Measured parameters before and introduction of the e-prescribing protocol.

	Pre-protocol n = 47 (%)	Post-protocol n = 33 (%)
Escalation plan documented?	34 (72)	29 (88)
Dexamethasone prescribed?	39 (83)	27 (82)
If not prescribed dexamethasone, is there a documented reason?	1 (13)	5 (83)
If prescribed dexamethasone, PPI prescribed?	27 (63)	19 (70)
Remdesivir prescribed?	27 (57)	13 (39)
If not prescribed remdesivir, is there a documented reason?	7 (35)	13 (65)
VTE prophylaxis prescribed?	46 (98)	32 (97)
If not prescribed VTE prophylaxis, is there a documented reason?	0 (0)	1 (100)
Oxygen prescribed?	20 (43)	26 (79)
Oxygen requirement?	38 (81)	23 (70)
PRN Novorapid® prescribed?	12 (27)	15 (48)
If prescribed remdesivir, LFTs ordered for next day?	20 (77)	10 (77)

medication individually.

This protocol included options to prescribe dexamethasone, PRN Novorapid®, PPI, remdesivir and oxygen as well as prompts to prescribe VTE prophylaxis and to monitor blood glucose levels if prescribed dexamethasone.

All of the prescribing options were based on guidance at the time for acutely admitted COVID-19 patients, aiming to consolidate the task of prescribing the several medications required into a single streamlined process.

PDSA cycle:

The protocol was introduced in January 2021. Information was disseminated to medical consultants, junior doctors and pharmacists via email and the intranet, following which pharmacists would also remind teams on the post take ward round about this orderset. Teaching sessions were organised by the department of infection and information was added to the electronic noting system.

A re-audit was undertaken in mid-January 2021 over a 48 h period, using the same methods.

A qualitative survey was sent out to all junior doctors working in acute and general medicine in order to understand their awareness of the protocol, as well as views on its ease of use and effect on adherence to guidance. It also asked for feedback on possible improvements to the protocol.

A further PDSA cycle was initially planned for after the implementation of feedback and updating the protocol to reflect new guidance, however declining COVID-19 case numbers made this difficult to achieve.

Results:

The initial audit identified 47 COVID-19 patients admitted acutely over a 48-hour period, and 24 further positive swabs that were excluded as per the criteria above. After the introduction of the protocol, 33 patients acutely admitted with COVID-19 were identified, and a further 34 positive swabs were excluded.

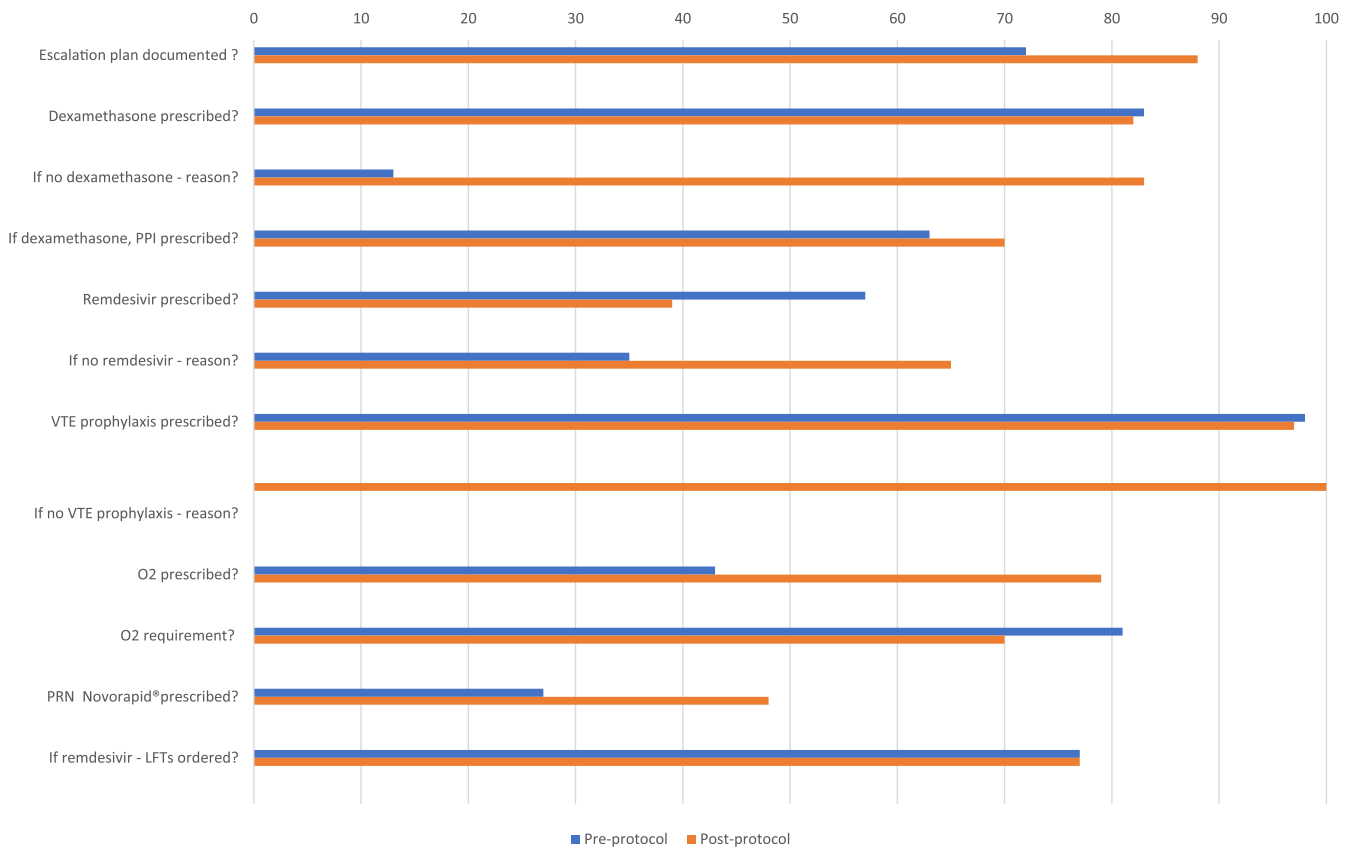


Fig. 1. Measured parameters before and after introduction of protocol (percentages).

Full results are described in Table 1.

Prescriptions of dexamethasone and VTE prophylaxis remained high both before and after introduction of the e-prescribing protocol; dexamethasone was prescribed for 83% (39/47) of patients pre protocol, and 82% (27/33) post-protocol, while VTE prophylaxis was prescribed for 98% (46/47) and 97% (32/33) of patients pre- and post-protocol respectively (Fig. 1).

There was a substantial increase in prescription of both oxygen and PRN Novorapid® (for patients prescribed dexamethasone). Oxygen prescribing improved from 43% (20/47) pre-protocol to 79% (26/33) post protocol, while an oxygen requirement was comparable in both groups – at 81% (38/47) pre-protocol and 70% (23/33) post protocol. PRN Novorapid® prescriptions for patients prescribed dexamethasone

improved from 26% (12/44) to 48% (15/31) after introduction of the protocol (Fig. 1).

Documentation of escalation plans also improved from 72% (34/47) to 88% (29/33). Prescriptions for remdesivir reduced slightly from 57% (27/47) to 39% (13/33). Of note, where patients were not prescribed either dexamethasone or remdesivir, documentation of why this was not prescribed improved from 13% (1/8) to 80% (5/6) for dexamethasone and from 35% (7/20) to 65% (13/20) for remdesivir after introduction of the protocol. (Table 1, Fig. 1 and Fig. 2). These reasons included renal or liver impairment, presenting after day 10 of symptoms and a lack of oxygen requirement.

From the qualitative survey, out of 27 responses, 25 (93%) were aware of the protocol and 22 (82%) had used it. When asked to rate their

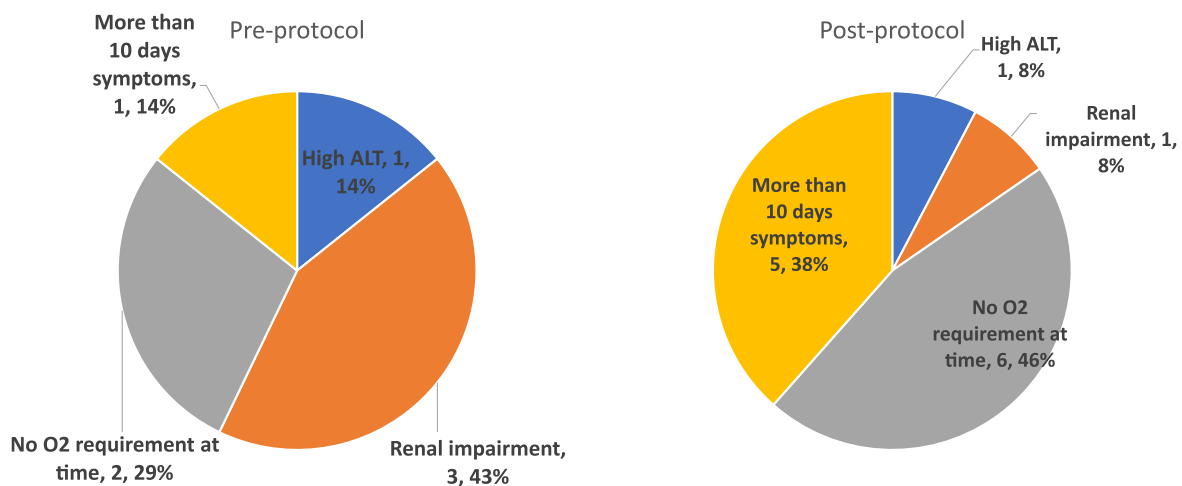
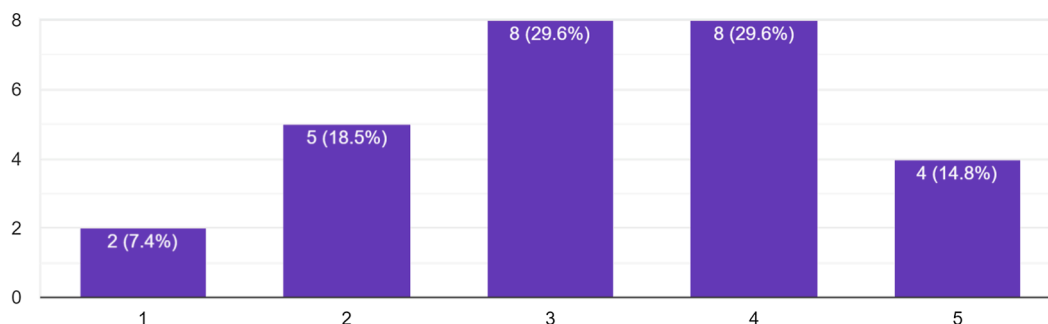


Fig. 2. Documented reasons for not prescribing remdesivir:

How confident were you in adhering to the COVID bundle before the COVID medchart protocol was introduced?

27 responses



How confident were you in adhering to the COVID bundle after the medchart protocol was introduced?

27 responses

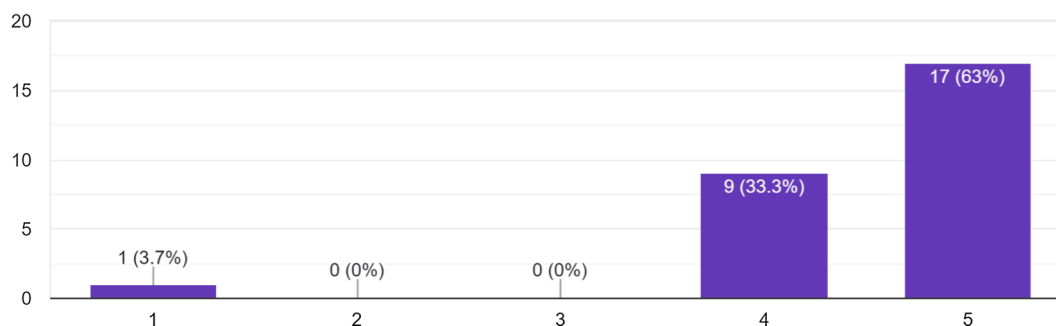


Fig. 3. Confidence in adherence to guidance before and after introduction of protocol (1 = not at all confident, 5 = very confident).

confidence in adhering to the COVID-19 prescribing bundle respondents reporting being quite or very confident increased from 44% (12/27), to 96% (26/27) after introduction of the protocol (Fig. 3). Similarly, 94% of respondents found the protocol easy to use and 78% agreed it made it easier to adhere to guidance (Figs. 4 and 5). Written feedback was generally positive, and included one respondent pointing out that prescribers should be aware that not all aspects of the protocol apply all of the time.

Discussion:

As evidence for therapeutics in COVID-19 emerged following the first wave of the pandemic in the UK, guidance was rapidly adapted at a national and local level and became more complex, with the introduction of new agents, unclear monitoring requirements for those agents, and new requirements for treatment of side effects of those agents.

This project aimed to improve adherence to this complex guidance during the second wave of the COVID-19 pandemic, in the context of a significantly increased workload and with many prescribers redeployed. It was identified that this could potentially be achieved through a

How easy is the COVID medchart protocol to use?

27 responses

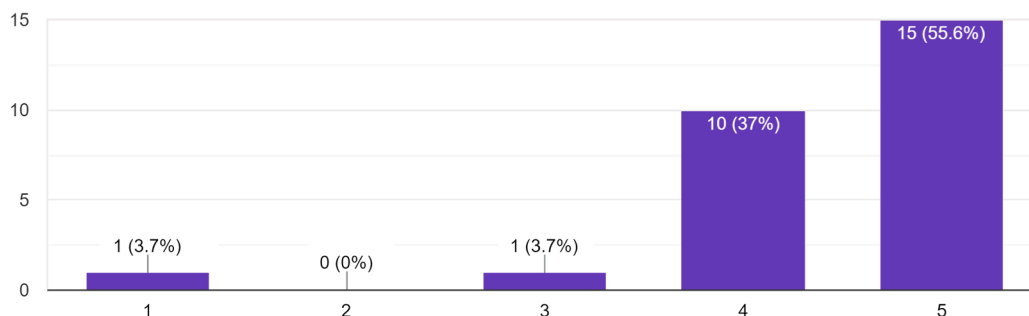


Fig. 4. Qualitative survey results – ease of use (1 = very difficult, 5 = very easy).

Please rate how much you agree with the following statement: "The COVID medchart protocol makes it easier to adhere to COVID prescribing guidance"

27 responses

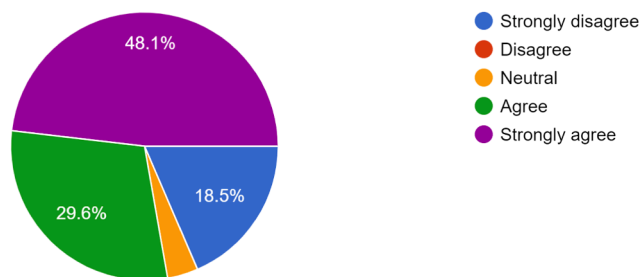


Fig. 5. Qualitative survey results – does the protocol make it easier to adhere to guidance.

dedicated COVID-19 e-prescribing orderset - a single streamlined process, integrated with current guidance that would make prescribing for an acutely admitted patient with COVID-19 quicker and more straightforward.

While prescription rates of certain medications – such as dexamethasone and VTE prophylaxis – were high and were not significantly changed by the orderset, other medications – in particular PRN Novorapid® and oxygen – prescription rates improved substantially. Furthermore, documentation of reasons for not prescribing dexamethasone and remdesivir improved. Moreover, qualitative feedback indicated that this protocol made adhering to complex prescribing guidance easier, and improved the confidence of prescribers. The fact that prescription rates for dexamethasone and VTE prophylaxis were high and unchanged by the protocol may signify that it did not improve prescribing of medications where awareness was already high amongst prescribers, and that it had a greater effect on less well-known parts of the prescribing guidance.

Other projects have investigated the use of technology to rapidly disseminate quality information during the COVID-19 pandemic. In Wales, COVID-19 guidance was incorporated into a dynamic national online platform which was disseminated to health workers throughout the country. This was done very rapidly, with only three weeks between commissioning and initiation of the guideline, and found significant success in engaging the workforce – with 45% of all consultants employed in Wales registering (Jefferies et al., 2021). Additionally, electronic prescribing support tools such as the Antibiotic Review Kit (ARK) decision aid have been used outside of COVID-19 – this has been evaluated in a multicentre study and found to result in mean reductions of antibiotic use of 4.8% per year (Llewelyn et al., 2022).

Results of a prior project introducing a 'COVID care bundle' suggested that the introduction of new guidance and documentation alone was insufficient to create immediate and sustainable change, and that the process of prescribing needed to be made easier to affect the improvement required.

As this required a change to e-prescribing software, multidisciplinary communication was key, and having readily accessible senior input from pharmacy and the Infectious Diseases team, as well as the collaboration of the e-prescribing software team itself was invaluable. Due to this senior buy-in and focus of resources during the pandemic, changes were implemented rapidly - within two working weeks of initial discussions. The views of junior doctors on the ward and prescribing pharmacists were also sought, in order to have a pragmatic focus on how this tool would be deployed.

The qualitative survey shed light on how useful prescribers found the protocol, and consequently whether the improvements seen were due to the protocol itself or to other factors. It is however possible that these

improvements were the result of increased familiarity with the prescribing guidance as the pandemic went on.

There are other limitations to this approach; there is a risk of a protocol becoming a 'tick-box exercise', and prescribers not actively considering their individual patient. As expressed in our qualitative feedback: "prescribers need to be aware that not all components of the bundle are appropriate all of the time". For example, it may be better to avoid prophylactic PPI when prescribing dexamethasone in patients with hyponatraemia.

Additionally, guidance develops, and if prescribers become reliant on protocols, then it is important that they are updated or newer recommendations may get missed. This may be challenging when software support is no longer prioritised outside of the context of the pandemic.

This protocol has been updated to reflect new treatments as they have become available.

Conclusions:

This project demonstrates that an e-prescribing protocol improved adherence to guidance in COVID-19. In particular, an improvement in rates of oxygen prescribing was noted, as this has historically been difficult to achieve (Barrett et al., 2021 Feb). This indicates the usefulness of e-prescribing ordersets, especially in common conditions where treatment is highly protocolised. The integration of current guidance within the orderset may also have been beneficial to less experienced prescribers or those redeployed from elsewhere. This demonstrates how existing technologies can be adapted to make patient care safer and decrease the burden for busy health care workers. In order to achieve this, it was imperative to engage the multidisciplinary team and seek the input and ongoing feedback of the prescribers themselves.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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