

# 1 Deprescribing admission medication at a UK teaching hospital; a 2 report on quantity and nature of activity

## 3 Introduction

4 Prescribing of a medication is informed by numerous factors including the diagnosis, general health and psycho-  
5 social circumstances of the patient[1]. As these factors are not static; monitoring is required to ensure the  
6 prescribing does not result in a potentially inappropriate medicine (PIM). PIMs are those which are believed to  
7 afford more risks than benefits and are a pre-disposition to harms including adverse drug events, disability and  
8 mortality[2]. A multi-centre prospective analysis of older people's admission medication reported PIM  
9 prevalence ranging from 34.7% to 77.3% across six European university teaching hospitals[3].

10 The term 'deprescribing' has been defined as the "*systematic process of identifying and discontinuing drugs in*  
11 *instances in which existing or potential harms outweigh existing or potential benefits...*"[4]. Accordingly,  
12 deprescribing a medication may be in response to an adverse clinical trigger (reactive) or an attempt to reconcile  
13 risks of maintaining versus discontinuing (proactive)[5].

14 While the number of studies investigating clinically significant outcomes associated with deprescribing are  
15 limited, deprescribing appears safe and has been associated with positive effects on mortality and falls in certain  
16 circumstances[6]. Central to ensuring that deprescribing is safe and effective is an accurate medication history  
17 and provision for adequate physiological monitoring to observe response to medication withdrawal[4]. Given  
18 these requirements, an admission to hospital where a medication history is routinely undertaken and  
19 physiological parameters are routinely monitored, may provide an appropriate opportunity for a deprescribing  
20 intervention. However, deprescribing practice in hospital is poorly understood and there is a need identify the  
21 extent to which it currently occurs[7].

## 22 Aim of the study

23 To quantify and describe the nature of admission medication deprescribing practice in a large UK teaching  
24 hospital.

## 25 Ethics approval

26 The study was confirmed as a service evaluation by the University of East Anglia Faculty of Medicine and  
27 Health Sciences Research Ethics Committee (Reference: 2016/2017 - 52 SE).

## 28 Method

29 A retrospective analysis of all admission medications prescribed and discontinued at a large UK teaching  
30 hospital was undertaken over four weeks in February 2017. Data were extracted from the hospital's electronic  
31 prescribing (e-prescribing) system for all wards and specialities except the Emergency Department and Intensive  
32 Care Unit as e-prescribing was not implemented in these areas. Prescriptions newly initiated during the  
33 admission and medication recorded as temporarily suspended were excluded because the study was designed to  
34 capture the extent to which admission medicines are deprescribed.

35 Patient sex and age, medication name and the e-prescribing reason for medication discontinuation (selected by  
36 the prescriber from a list of 20 pre-defined reasons on the e-prescribing system, provided in Figure 1) were  
37 analysed.

38 Not all medications recorded as discontinued on the e-prescribing system are 'deprescribed', such as those  
39 assigned the e-prescribing reason 'Incorrect prescription' or 'Changed to when required'. Accordingly, a team  
40 of clinical pharmacists and consultant physicians classified the e-prescribing reasons into 'not considered  
41 deprescribing' (excluded from analysis) and 'potentially deprescribing' as described in Figure 1.

42 A sample of 200 medication discontinuations assigned a 'potentially deprescribing' e-prescribing reason were  
43 further analysed by reviewing medical records to confirm or refute deprescribing activity and categorise the  
44 activity into proactive or reactive. This sample size provides a 95% confidence interval of  $\pm 3.0\%$  around the  
45 estimate of the quantity of deprescribing. As there are no estimates of deprescribing prevalence in usual hospital  
46 care, the estimate is based on a UK deprescribing intervention trial reporting 8.5% of admission medicines  
47 deprescribed[8]. Accepting this will be lower in the absence of an intervention, we estimated a maximum of  
48 5.0% admission medicines likely to be deprescribed.

49 The majority of e-prescribing reasons are unambiguous such as "Acute kidney injury". However, the reason "No  
50 longer clinically necessary" was deemed ambiguous by the local clinical team as in their experience this was  
51 often selected by prescribers when a suitable reason could not be identified. Medication discontinuations not  
52 assigned an e-prescribing reason were also considered ambiguous. Accordingly, sampling of 200 medication  
53 discontinuations was stratified, with a smaller number of discontinuations assigned unambiguous reasons (one-  
54 sixth of the total or 100% if three or less occurrences) sampled. Medication discontinuations assigned the  
55 ambiguous reason and where no reason was given were evenly sampled for the remaining reviews. Figure 2  
56 provides the numbers sampled across the e-prescribing reason strata.

57 Informed by the existing literature[5], academics, senior hospital clinicians, patients and carers, the following  
58 definitions were developed and used to categorise deprescribing behaviour:

- 59 • Reactive deprescribing: discontinuing a medicine in response to an adverse clinical trigger
- 60 • Proactive deprescribing: discontinuing a medicine if future gains are unlikely to outweigh future harms

61 One clinical pharmacist extracted the prescriber's rationale for medication discontinuation verbatim from  
62 medical records. Each discontinuation was independently categorised by a clinical pharmacist and consultant  
63 physician into proactive, reactive or not deprescribing. Inter-rater reliability was assessed using Cohen's Kappa,  
64 with  $k=0.6-0.8$  considered good and  $k>0.8$  excellent[9]. Disagreements were resolved through reviewer  
65 discussion and referral to a third reviewer if necessary.

66 Data from the stratified sample of 200 reviews were extrapolated to the total 'potentially deprescribing'  
67 discontinuations through multiplying sample deprescribing prevalence within each reason statement by the total  
68 number of discontinuations within each reason statement. These were summed to estimate the total proportion  
69 and 95% confidence interval (95% CI) of admission medicines deprescribed in hospital and the proportion (95%  
70 CI) which were reactive and proactive.

## 71 Results

72 From 24,552 admission medicines prescribed for 2,309 patients, 977 discontinuations were recorded across 415  
73 patients, of which 682 (69.8%) were 'potentially deprescribing' according to the e-prescribing reason. Females  
74 constituted 228 (54.9%) patients and the median (IQ) age was 79.0 (66.0, 86.0) years. Figure 1 provides the e-  
75 prescribing reasons for discontinuation retained and excluded from the analysis according to whether they were  
76 potentially consistent with deprescribing as defined in the introduction.

77

78 **Fig.1** E-prescribing recorded medication discontinuations excluded and retained from analysis according to the  
79 e-prescribing reason selected by the prescriber.

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81 Stratified sampling and, proactive and reactive categorisation of the 200 medication discontinuations further  
82 analysed by reviewing the medical records are described in Figure 2. Unambiguous e-prescribing reasons  
83 accounted for 21.0% of the sample. The remaining 158 (79.0%) records were evenly sampled from the  
84 ambiguous e-prescribing reason "No longer clinically necessary" and from no e-prescribing reason recorded.

85 One-hundred and forty-three (71.5%) discontinuations reviewed were not consistent with the definitions for  
86 proactive or reactive deprescribing for the reasons; end of life care, treatment escalation or the medication being  
87 stopped in error. For a further 13 (6.5%), insufficient information was available for categorisation. The  
88 remaining 44 (22.0%) confirmed deprescribing activities were categorised into 7 (15.9%) proactive and 37  
89 (84.1%) reactive. Agreement between reviewers categorising deprescribing activity was excellent ( $\kappa=0.872$ ,  
90  $p<0.01$ ).

91 Reasons provided in the medical records for medication deprescribed reactively were; side effect (21 (56.8%)),  
92 acute kidney injury (8 (21.6%)), treatment failure (5 (13.5%)), swallowing difficulty (1 (2.7%)), allergic  
93 reaction (1 (2.7%)) and interaction with other treatment (1 (2.7%)). All proactive deprescribing was in response  
94 to resolution of the indication for which the medication was first prescribed as reported by the patient or  
95 physiological parameters.

96 Extrapolation of the 200 stratified sample data to the 682 total discontinuations yielded 22.01% (19.0%-25.2%)  
97 consistent with deprescribing, of which 19.2% (12.9%-25.5%) are proactive and 80.8% (75.5%-87.1%) are  
98 reactive. This corresponds to 0.6% (0.5%-0.7%) of all admission medications prescribed being deprescribed.

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100 **Fig. 2** Categorisation of a stratified sample of 200 recorded medication discontinuations and extrapolation to the  
101 total 682 recorded medication discontinuations potentially considered deprescribing (according to the e-  
102 prescribing reason provided)

103 \*Medication discontinued however rationale provided in the medical records was not consistent with proactive  
104 or reactive deprescribing e.g. medication discontinued due to end of life diagnosis

105 \*\*Medication re-prescribed at the point of medical records review. Medication discontinuation recorded for an  
106 erroneous reason such as discontinued in error and immediately re-prescribed.

## 107 Discussion

108 Very limited deprescribing activity was identified in this one UK hospital. Dominance of reactive deprescribing  
109 suggests that prescribers require the presence of a clinical trigger such as an adverse drug event to prompt  
110 deprescribing. The low levels of proactive deprescribing are in accordance with primary care research which  
111 reports that practitioners find it challenging to evaluate potential risks and harms associated with medication to  
112 inform deprescribing[5]. It is conceivable that hospital practitioners may also find this challenging. Findings

113 from the present study endorse this hypothesis, as the observed proactive deprescribing was only in cases with  
114 documented evidence of no clinical benefit thus only potential for harm. There was therefore no proactive  
115 deprescribing identified as a result from a complex evaluation of risks and benefits.

116 Accepting the limitations of not assessing the prevalence of PIMs in the present study, given that the  
117 deprescribing prevalence was 0.6% it can be concluded that the vast majority of PIMs are unlikely to be being  
118 discontinued during the hospital admissions. There may therefore be scope for increasing proactive  
119 deprescribing activity in hospital. However, the extent to which this is feasible and acceptable is as yet  
120 unknown. A future study should therefore seek to explain low proactive deprescribing activity in hospital and  
121 explore the support required for prescribers and patients to increase this activity.

122 There are two key limitations to this study. Firstly, data is limited to one UK hospital, restricting the  
123 generalisability of findings. More widespread analysis of deprescribing in hospital is warranted for comparison.  
124 Secondly, the large proportion of sampled medication discontinuations that were not deprescribing incorporates  
125 a degree of ambiguity around the final proportions. Random, stratified sampling and extrapolation of almost a  
126 third of the total medication discontinuations was employed to mitigate this limitation.

## 127 Conclusion

128 The one teaching hospital under investigation was found to be undertaking very limited deprescribing activity,  
129 which was dominated by reactive behaviour. Where significant deprescribing is identified this could be explored  
130 to understand the reasons underpinning the behaviour.

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## 133 Conflicts of interest

134 The authors declare no conflicts of interest.

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170 Medication discontinuations  
not considered deprescribing  
according to the e-prescribing  
reason were removed from  
further analyses  
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E-prescribing discontinued  
medications recorded n=977

- Not considered deprescribing (n=295)
- Palliative (110)
  - Incorrect prescription (n=66)
  - Enablement policy (n=54)
  - Non-formulary drug (n=27)
  - Duplicate (n=18)
  - Changed to when required (n=3)
  - Changed to regular (n=9)
  - Course complete (n=8)

- Potentially deprescribing (n=682)
- No longer clinically necessary (n=328)
  - No reason documented (n=138)
  - Route no longer appropriate (n=87)
  - Formulation no longer appropriate (n=64)
  - Interaction with other treatment (n=20)
  - Biochemistry deranged (n=14)
  - Patient refusing to take (n=7)
  - Renal impairment (n=7)
  - Haemodynamically unstable (n=6)
  - Suspected toxicity/high levels (n=4)
  - Blood dyscrasia (n=3)
  - Acute kidney injury. Not to be restarted (n=2)
  - Drowsy (n=2)

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185 Stratified sample of 200 medication  
discontinuations considered to be potentially  
deprescribing analysed by reviewing medical  
records to establish whether deprescribing, and  
categorise deprescribing behaviour as reactive  
or proactive (see Figure 2).  
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**Analysis of 200 medication discontinuation by medical records review**

