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

Introduction

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

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

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

Aim of the study

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

Ethics approval

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

Method

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

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

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

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

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

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

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

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

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

Results

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

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

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

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

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

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

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

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

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

Discussion

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

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

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

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

Conclusion

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

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Conflicts of interest

The authors declare no conflicts of interest.

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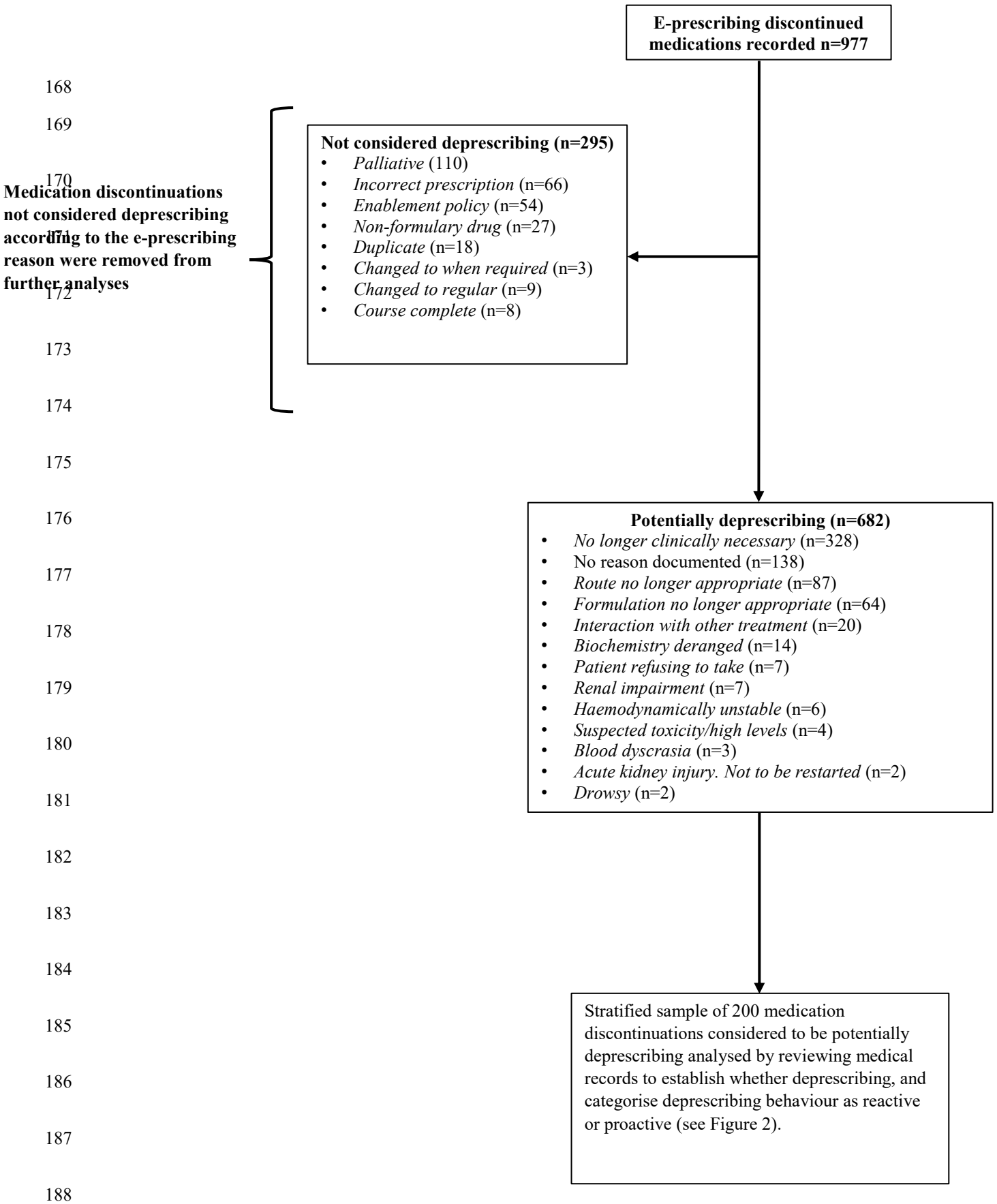
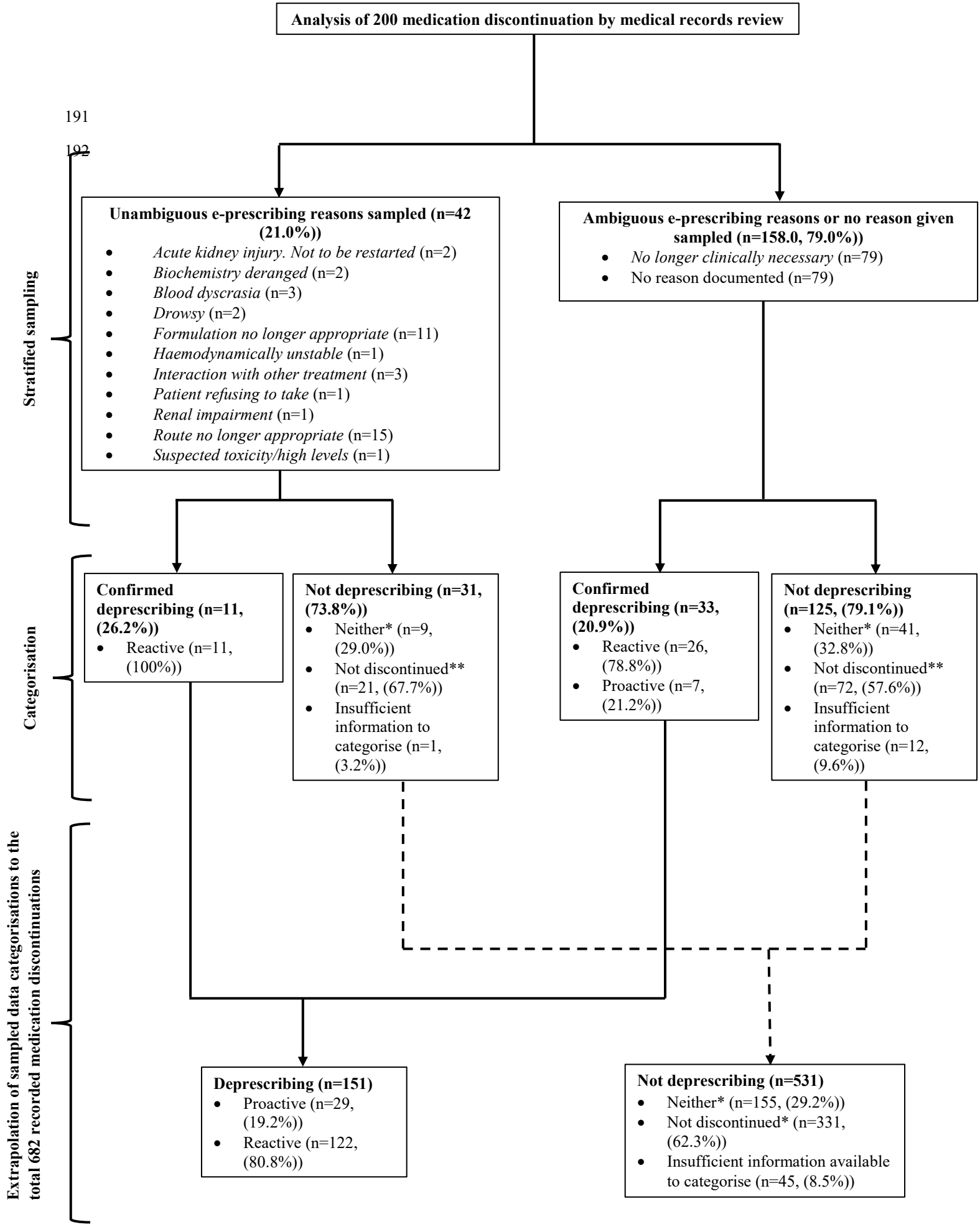

E-prescribing discontinued medications recorded n=977
Medication discontinuations not considered deprescribing according to the e-prescribing reason were removed from further analyses
Not considered deprescribing (n=295)
• Palliative (110)
• Incorrect prescription (n=66)
• Enablement policy (n=54)
• 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)
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).


Analysis of 200 medication discontinuation by medical records review
191
192
Stratified sampling
Unambiguous e-prescribing reasons sampled (n=42 (21.0%))
Acute kidney injury. Not to be restarted (n=2)
Biochemistry deranged (n=2)
Blood dyscrasia (n=3)
Drowsy (n=2)
Formulation no longer appropriate (n=11)
Haemodynamically unstable (n=1)
Interaction with other treatment (n=3)
Patient refusing to take (n=1)
Renal impairment (n=1)
Route no longer appropriate (n=15)
Suspected toxicity/high levels (n=1)
Ambiguous e-prescribing reasons or no reason given sampled (n=158.0, 79.0%))
No longer clinically necessary (n=79)
No reason documented (n=79)
Categorisation
Confirmed deprescribing (n=11, (26.2%))
Reactive (n=11, (100%))
Not deprescribing (n=31, (73.8%))
Neither* (n=9, (29.0%))
Not discontinued** (n=21, (67.7%))
Insufficient information to categorise (n=1, (3.2%))
Confirmed deprescribing (n=33, (20.9%))
Reactive (n=26, (78.8%))
Proactive (n=7, (21.2%))
Not deprescribing (n=125, (79.1%))
Neither* (n=41, (32.8%))
Not discontinued** (n=72, (57.6%))
Insufficient information to categorise (n=12, (9.6%))
Extrapolation of sampled data categorisations to the total 682 recorded medication discontinuations
Deprescribing (n=151)
Proactive (n=29, (19.2%))
Reactive (n=122, (80.8%))
Not deprescribing (n=531)
Neither* (n=155, (29.2%))
Not discontinued* (n=331, (62.3%))
Insufficient information available to categorise (n=45, (8.5%))