

## Accessing the Latest Medicines Information and Minimising Error

**Dr Anne Aboaja**, *Consultant Forensic Psychiatrist<sup>1</sup> and Honorary Senior Clinical Lecturer<sup>2</sup>*; **Fiona Mack**, *Clinical Pharmacist<sup>3</sup>*; **Eduardo Ensaldo-Currasco**, *PhD Researcher in Patient Safety<sup>2</sup>* and **Dr Alexandra Stirzaker**, *Core Medical Trainee Year 2 Doctor<sup>4</sup>*

*1 Tees, Esk and Wear Valleys NHS Foundation Trust*

*2 Centre for Population Health Sciences, Usher Institute, College of Medicine and Veterinary Medicine, University of Edinburgh*

*3 Royal Edinburgh Hospital, NHS Lothian*

*4 Royal Infirmary of Edinburgh, NHS Lothian*

Correspondence to: [anne.aboaja@ed.ac.uk](mailto:anne.aboaja@ed.ac.uk)

---

### Abstract

#### *Title*

Accessing the Latest Medicines Information and Minimising Error

#### *Author list*

Aboaja A, Mack F, Ensaldo-Carrasco E, Stirzaker A.

#### *Introduction*

Healthcare staff involved in prescribing and dispensing need to access the latest medicines information to avoid making errors. This information is available in paper and electronic formats. Little is known about the accessibility of the different forms of medicines information. This study aims to determine the accessibility of the latest medicines information obtained from the British National Formulary (BNF), in paper or electronic format, in a mental health service.

#### *Method*

Seventy-six clinical areas were surveyed for ready accessibility to paper and electronic BNF formats. In a separate cross-sectional survey, 25 doctors provided quantitative and qualitative data on access to the latest BNF medicines information.

#### *Results*

The latest BNF medicines information was readily accessible in two-thirds (n=51; 67%) of clinical areas. Limited availability of up-to-date BNF editions and of technology are barriers to accessing the latest BNF medicines information and increase the potential risk of doctors making prescribing errors.

#### *Discussion*

The latest BNF medicines information available is not always readily accessible. This is a serious concern for patient safety and warrants an immediate response from doctors, non-medical prescribers, pharmacists and health managers, as well as a review of the national provision of the BNF.

#### *Conclusion*

There is great value in promoting a system and culture that supports health workers in readily accessing only the latest medicines information to minimise error and improve patient safety.

**Keywords:** patient safety, prescribing, mixed methods, mental health, BNF.

## Introduction

### Prescribing errors in healthcare

Historically, errors in medicine have been managed using a person-centred approach which has concentrated on the errors made by individuals to whom interventions and countermeasures would then be targeted.<sup>1</sup> In recent times there has been a shift towards a systems approach on the basis that 'though we cannot change the human conditions, we can change the conditions under which humans work'.<sup>2</sup> With this approach, error management is not directed towards individuals per se, but towards the system, especially the precise point in a system at which an error first occurs and leads to suboptimal care. Mann et al<sup>3</sup> suggested that the root causes of identified errors should be identified. Medication errors are an important cause of adverse events in healthcare and the causes of such errors have been studied worldwide.<sup>4,5</sup> On the basis of modern error management concepts, this study targets both an early stage in the prescribing process and an under-reported cause of medication errors, namely the accessibility of the latest medicines information.

### Accessing the latest medicines information to optimise prescribing

Whilst it is essential that prescribers remain up-to-date with changes in psychopharmacology through Continuing Professional Development and Learning in order to reduce prescribing errors and threats to patient safety, it is also important that they have ready access to the latest medicines information. Among hospital doctors an important source of medicines information for adults in the UK is the British National Formulary (BNF),<sup>6,7</sup> which is published by the Royal Pharmaceutical Society (Pharmaceutical Press) and the British Medical Association (BMJ Group). Approximately 24 new drugs are added to the BNF each year.<sup>8</sup> Paper editions are updated and published biannually and, until recently, were circulated free of charge to eligible doctors and other health professionals. However, in 2015, a UK government decision meant that doctors now receive the updated paper edition only once a year. The BNF is also available in standard online and mobile application formats, which are regularly updated and contain the most up-to-date information.

### The problem of accessing the latest medicines information

Doctors do not always have immediate access to the paper BNF and this can contribute to prescribing errors.<sup>9</sup> Little is known about whether the paper BNF, when readily accessible, provides the latest medicines information. There is also a lack of information about the ready accessibility of electronic formats of the BNF as alternative means of accessing the latest medicines information when doctors do not have immediate access to the paper BNF. For these reasons, the concern that the latest medicines information may not be readily accessible to doctors is plausible and was explored by conducting the present study. The study reported, which formed part of a clinical audit cycle, aims to measure and explain the accessibility of the latest medicines information obtained from the British National Formulary (BNF).

## Method

### Ethics and approval

The study proposal was reviewed by the NHS Lothian Research and Development department and approved by the NHS Lothian Quality Improvement Team.

### Data collection

A cross-sectional, mixed-methods study was conducted in two parallel and independent parts by different team members. At the time of the study, the most recently published BNF was the 70th edition (September 2015 - March 2016).

The first part of the study measured the accessibility of the latest BNF medicines information in key clinical areas. During a two-week period, a team of pharmacists visited the inpatient, outpatient and community clinical sites in the study mental health service and identified clinical areas where doctors working would usually prescribe medication. A consulting room was counted as one discrete clinical area. Using a purpose-designed data collection form, the pharmacists recorded data on the availability of the BNF medicines information in paper and online formats in each clinical area.

The second part of the study surveyed doctors regarding access to the latest BNF medicines information. A list was obtained of all 62 doctors of any grade working in the local mental health service, which covers a population of 0.5 million. In order to avoid bias, the names of doctors in the project team were excluded. Doctors were invited to participate in the study and advised of participant anonymity and the voluntary nature of participation. A 10-item survey was designed to collect quantitative and qualitative data from individual doctors about access to various formats of the BNF and reasons for not always accessing the latest BNF medicines. The last item of the survey required doctors to provide answers to three dosage questions using the edition of the paper BNF closest to them at the time of survey completion. The questions were selected to reflect revised dosage changes in recent editions of the BNF in the last two years.

### Data analysis

In analysing the data from the last item of the doctors' survey, the dosage provided by each respondent was compared with the dosage stated in the latest (70th) edition of the BNF. The result of prescribing according to dosage given by each respondent's was grouped into four categories: 'correct prescribing' if the respondent's dosage was identical to 70th edition dosage; 'underprescribing' if the respondent's dosage was lower than the 70th edition dosage; 'overprescribing' if the respondent's dosage was higher than the 70th edition dosage; and 'not applicable' if the respondent had not written the dosage. According to these categories the potential impact on patient safety was determined as follows: correct prescribing would potentially maintain patient safety; underprescribing would potentially lead to undertreatment of the patient's condition; overprescribing would potentially lead to overtreatment and risk associated with high dosage. All quantitative data from the study were analysed using descriptive statistics. Qualitative data from the doctors' survey were analysed thematically and then placed within the Yorkshire Contributory Factors Framework, a model developed by the

Humber Academic Health Science Network (AHSN) Improvement Academy for the identification of contributory factors to patient safety incidents in hospital settings.<sup>10</sup>

## Results

Seventy-six clinical areas were fully surveyed by the pharmacists. Specific clinical areas included: dispensaries, duty rooms, treatment rooms, doctors' offices, community mental health team offices, interview rooms and consulting rooms.

### Accessibility of the latest BNF medicines information in clinical areas

Of the 76 clinical areas included in the survey, two-thirds (n=51; 67%) had electronic access to the BNF. Although a paper BNF was readily accessible in 56 clinical areas (74%), this was usually out of date (n=52; 93%) with only four (7%) containing the most recent edition, the 70th. Of the 52 clinical areas containing an out-of-date paper BNF, just under seven (13%) had copies labelled as such using a 'superseded' sticky label, drawing attention to users that a more recent edition was available. Editions of dated BNF copies ranged from the 69th (published March 2015) to the 45th (published March 2003).

Taking into account both paper and electronic versions of the BNF, the most recent BNF medicines information could be accessed in 50 (66%) clinical areas. There was no access to the

BNF in either format in 10 (13%) clinical areas. One-third of clinical areas did not have ready access to the latest BNF medicines information in either format (n=26; 34%). 26 (34%) clinical areas did not have internet access (Figure 1).

### Demographics of the doctors' survey participants

Twenty-five (40%) doctors working in the service participated in the study - 10 consultants, 3 associate specialist/staff grade doctors and 12 trainees (junior doctors) - reported working from home and in inpatient, outpatient and community settings. Twenty-three (92%) doctors had either a personal or NHS smartphone.

### Experience of using various formats of the BNF

Most (n = 21; 84%) doctors owned a paper copy of the BNF; four trainees did not have a personal copy. Of all the doctors who responded to the survey, 15 (60%) doctors stated they had the most recent edition of the paper BNF. The oldest BNF owned by a doctor was edition 60, published in September 2010. Sixteen (64%) doctors had experience of using the BNF online. 40% of doctors who participated in the survey stated that they use 'the latest paper edition published or the BNF online' when checking BNF medicines information. The remaining 60% of doctors reported using 'the most recent paper edition available at the time'.

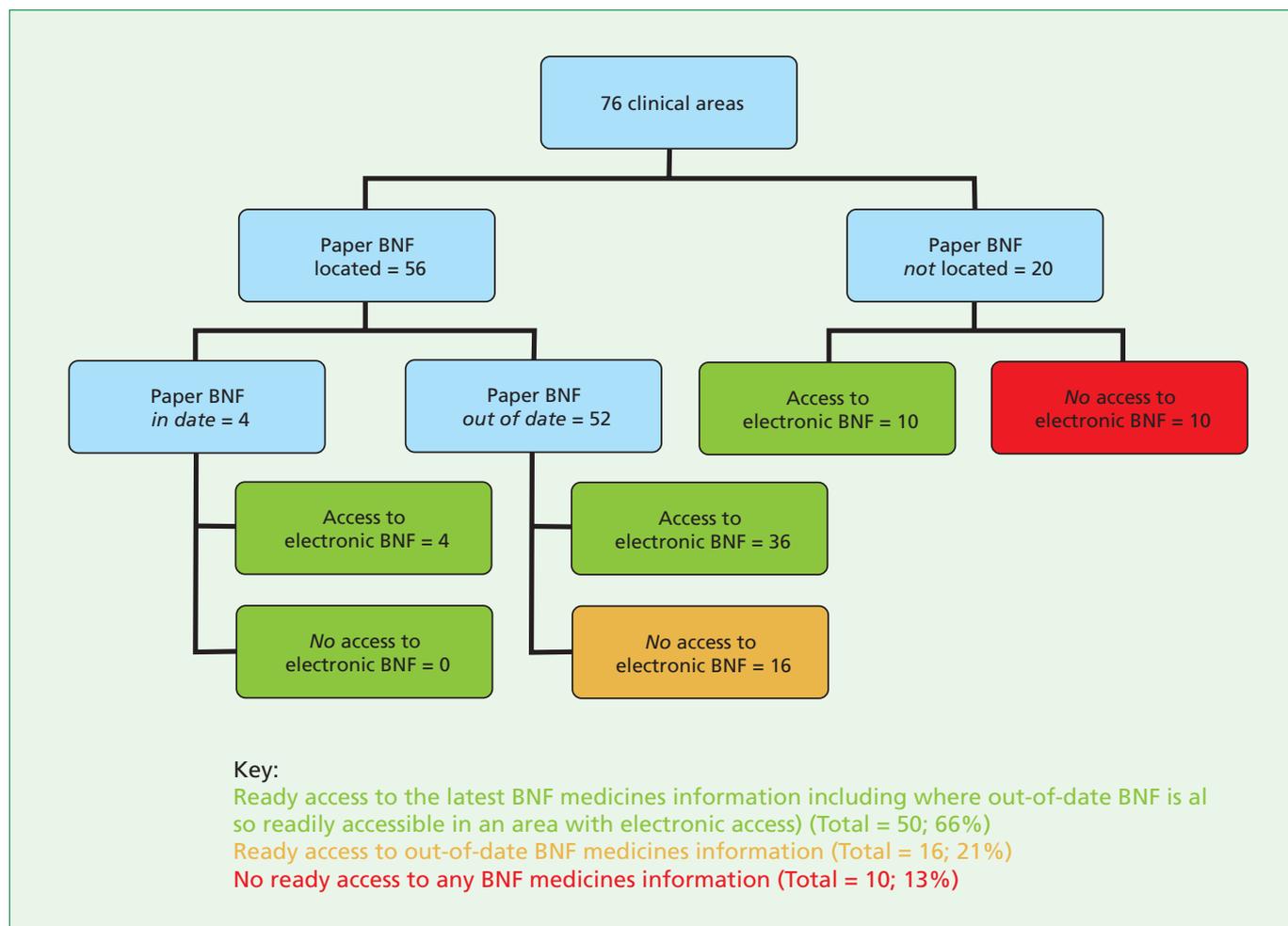


Figure 1: Accessibility of the latest BNF medicines information in clinical areas

## Prescribing errors due to using the BNF closest to the doctor

Of the 22 doctors who had a paper copy of the adult BNF nearby at the time of completing the survey, 12 (55%) had edition 70; 8 (36%) had edition 69; and 2 (9%) had an edition published before 2014. The responses to dosage questions provided by these 22 doctors using the BNF edition closest to them demonstrate the potential for suboptimal prescribing and for prescribing errors which could impact on patient safety (Table 1).

## Barriers to doctors accessing the latest BNF medicines information

The most frequently cited reasons given by doctors for not accessing the latest paper edition of the BNF related to limited availability in clinical areas and during community visits. In addition, doctors stated that, even if they had a personal copy of the latest paper edition, they did not always keep the copy with them. Trainees were the only doctors who expressed a preference for using an electronic form of the BNF (BNF app or BNF online) rather than the latest paper edition (Table 2).

The main barrier to accessing the BNF electronically were associated with limited access to devices which would permit access to electronic formats of the latest BNF medicine information from a range of sites. Some doctors reported administrative difficulties in accessing the BNF medicines information electronically. Not all doctors in possession of a smartphone carry them on to clinical areas. One consultant did not know the BNF online existed (Table 2).

## Discussion

Patient safety is a concern worldwide and the minimisation of medication errors is an important research area. The publication of regularly updated medicines information is a helpful resource for access by doctors who wish to prescribe medication safely. To our knowledge this is the first published study conducted within the NHS with the aim of measuring and explaining the accessibility of the latest medicines information through paper and electronic formats in order to reduce prescribing errors. It highlights the need for further improvement in facilitating the ready access of the latest medicines information by doctors.

## Interpretation of key findings

The most significant finding is that in one-third of clinical areas studied the latest BNF medicines information was not readily accessible. Ready accessibility in clinical areas of electronic formats of the BNF was higher than that of the latest paper edition of the BNF. Within this two-part study, the doctors' survey findings were consistent with the results of the survey of clinical areas; namely, that when a paper BNF is located in a clinical area, it may be out of date. It is possible that when consulting in a room equipped with both internet access and an old paper edition of the BNF, whether or not the prescribing doctor accesses the latest BNF medicines information might be determined by the following factors: awareness of the existence of the electronic BNF, personal preference of format, time available, computer internet speed, reliability and knowledge of accessing electronic format. The reliable access to the electronic BNF via a personal and mobile device such as a smartphone may also influence whether doctors access the latest BNF medicines information from a range of geographical sites.

| Prescribing question  | Dosage reported by doctor  | No. of doctors | BNF edition consulted | Result of prescribing according to BNF edition consulted | Potential impact on patient safety     |
|---|----------------------------|----------------|-----------------------|--|--|
| Total maximum dose of oral haloperidol for the treatment of schizophrenia | 15 mg                      | 1              | 60                    | Underprescribing   | Risk to patient due to undertreatment  |
|   | 20mg                       | 19             | 69, 70                | Correct prescribing                                      | Patient safety maintained              |
|   | 30mg                       | 1              | 65                    | Overprescribing  | Risk to patient due to high dosage     |
|   | No response                | 1              | 69                    | Not applicable   | Not applicable                         |
| Maximum dose of lisdexamfetamine in severe renal impairment               | 50mg                       | 12             | 70                    | Correct prescribing                                      | Patient safety maintained              |
|   | 70mg                       | 2              | 69                    | Overprescribing  | Risk to patient due to drug overdosage |
|   | "Does not say/cannot find" | 6              | 60, 65,69             | Not applicable   | Not applicable                         |
|   | No response                | 2              | 69                    | Not applicable   | Not applicable                         |

**Table 1: The potential impact of accessing different editions of the BNF on prescribing and patient safety**

## Barriers to accessing medicines information from the latest paper BNF edition (Yorkshire Framework contributory factor<sup>10</sup>)

### Theme 1: Limited availability of the latest edition in clinical areas (Equipment and supplies)

Wards don't get up-to-date copies so those in dispensaries and duty rooms are usually out of date, yet that is where we do our prescribing! (Consultant)

Unavailable in consultation room (SAS)

Old copies more accessible, new copy not located (Trainee)

Not with me (Consultant)

### Theme 2: Limited availability away from clinical areas (Equipment and supplies)

On a community visit and have no room for BNF. Not in a place with BNF when phoned about a query. (Consultant)

I work in various settings and do not always carry it (Trainee)

### Theme 3: Preference for accessing the electronic BNF instead of the paper format (Individual factors)

Cannot always find one [paper BNF] straight away so easier using phone. (Trainee)

I almost always use the BNF online if available, I find it easier to navigate (Trainee)

Use BNF app (Trainee)

## Barriers to accessing the electronic BNF

### Theme 1: Limited availability of the required computer technology

(Equipment and supplies; Support from central functions)

Lack of terminals/computers (Consultant)

Slow computers (Consultant)

If for some reason the computer system is not working (Trainee)

### Theme 2: Problems associated with mobile devices (Support from central functions)

Phone not always working for the app (Trainee)

No online access from phone. (Consultant)

Phone battery has died – use app (Trainee)

If on call, I will be talking on the phone needed to access BNF (Trainee)

Phone not always on me for the app (Trainee)

### Theme 3: Lack of awareness and training (Training and education)

Did not know about it (Consultant)

Hassle as have to register to use on smartphone (Trainee)

Do not have/cannot remember log on details (Trainee)

### Theme 4: Preference for accessing the paper BNF instead of the electronic format (Individual factors)

[I] am so used to flicking through BNF and having it in office for easy access. (Consultant)

I find it much quicker to use the latest paper edition to find exactly what I need to know (SAS)

[Electronic format] difficult to navigate (SAS)

On call not at a computer, quicker sometimes to access paper copy (Trainee)

[Electronic format] can be more cumbersome to use (Trainee)

**Table 2: Identified themes of barriers to accessing the latest BNF medicines information  
(with direct quotes from medical respondents)**

The qualitative component of the study design provided initial data on potential root causes of doctors not accessing the latest medicines information, which is an important step in reducing medication errors.<sup>3</sup> The doctors' survey showed that a system which results in the ready accessibility of out-of-date BNF copies can potentially lead to prescribing errors and adverse events which impact on patient safety, highlighting the importance of all prescribers having access to and accessing the latest medicines information. A systems approach is therefore required to reduce the ready accessibility of out-of-date medicines information and improve the ready accessibility of the latest medicines information.<sup>2</sup>

### Strengths and limitations of study

Although a wide range of clinical areas were surveyed, no data were collected for other medical specialities and, therefore, the study could be considered a pilot. In view of this, although the authors believe the problems identified may be relevant for all prescribers working in medical specialities outside of mental health, outside of the NHS and beyond the UK, the results of the present study cannot be confidently generalised beyond the service studied. It is assumed that trainees are generally younger than consultants but no data were collected on the ages of respondents to the doctors' survey. It is therefore not possible to comment on any potential age-related trends associated with a preference for using electronic forms of the BNF over the paper form, although the study by Patel et al<sup>11</sup> reported that junior doctors were more likely than senior doctors to access medicines information using a smartphone. Whilst the low response rate to the survey does not negate the findings, the results of the survey must be interpreted with some caution acknowledging not only the potential differences in BNF access between respondents and non-respondents but also the limitations of qualitative data.

It is recognised that the chain to medication errors has many links, of which the failure to access the latest medicines information is just one. The authors recognise that additional systems such as electronic prescribing and regular reviews by pharmacists may reduce the risk of incorrect prescribing leading to a risk of patient safety. Similarly, the results of the potential impact on patient safety based on the last item of the doctors' survey make a number of assumptions which may not reflect true practice. For example, a doctor who is aware of the latest medicines information may reject incorrect prescribing advice found in an out-of-date BNF edition.

### Comparison with existing studies

The study highlights the lack of access to the latest medicines information as a contributory factor of medication errors not described in a recent systematic review.<sup>5</sup> Additional factors which determine doctors' access of the latest BNF medicines information were identified and these compare well with the themes listed in the Yorkshire Contributory Factors Framework.<sup>10</sup> The personal preferences of doctors in accessing the latest medicines information was placed within the Yorkshire Framework category of 'individual factors'.<sup>10</sup> This finding is important because it suggests that, despite the availability of the electronic BNF, some doctors might still choose to use the printed format which might be outdated. Like most humans, doctors, especially those with a high clinical load and time constraints, tend to simplify: if the paper version is or appears

easier to use than the electronic version they will pick the paper version; if an out-of-date BNF is easier to find than a current edition, similarly they are likely to rely on the dated edition. The finding that 92% of doctors had access to a smartphone is consistent with the results of a study of the use of smartphones by surgeons in the UK.<sup>11</sup> A systematic review by Prgomet et al<sup>12</sup> found that the use of mobile handheld devices facilitate the prevention of medication errors. According to the review, smartphones can be a useful resource when desktop workstations are not available and for health professionals working across multiple locations, two barriers to accessing the latest medicines information reported by doctors in the present study. However, the study by Patel et al<sup>11</sup> highlighted the importance of the clinical culture being accepting of the regular use of smartphones in order for all doctors to feel comfortable using the technology. The range of doctors' preferences for using the various BNF formats suggests that the solution to the problem might be to ensure doctors have access to a combination of smartphones, mini-tablets, desktop computers, and only the most recently published print copy of the BNF, according to the needs of job in order that the latest medicines information can be readily accessed at all times.<sup>12</sup>

### Conclusions

The findings suggest that as long as the latest medicines information is not always readily accessible across all geographical areas of clinical work, doctors are at risk of making prescribing errors. An urgent review of current systems for accessing the latest BNF medicines information in different health organisations is recommended followed by any steps to reduce the ready accessibility of out-of-date medicines information. The supply and timely removal of printed editions of the BNF should be carefully planned. Health organisations should introduce a zero-tolerance approach to the presence of out-of-date BNF editions in clinical areas and encourage all staff to engage actively in a patient safety culture. It is recommended that reports are made to NHS National Reporting Learning System of any patient safety incidents (including near-misses) and adverse events due to prescribing errors as a result of accessing incorrect (out-of-date) medicines information in a clinical area.

Priority should be given to ensuring that all doctors, pharmacists and non-medical prescribers have ready, reliable and sustainable access to the latest medicines information, regardless of the format, whenever and wherever required for clinical duties to be undertaken efficiently and with high regard to patient safety. To achieve this, a combined effort by the government health department, directors of health organisations, health managers, and clinicians may be necessary. Reaching this goal is likely to require systemic changes, training and support for accessing the latest medicine information electronically, financial investment in technology, changes in clinical practice, cultural shifts with greater use of smartphones or other mobile devices, contingency planning for technology failure and regular audit based on the methodology of this study. Future studies should focus on the accessibility of the latest medicines information in non-psychiatric specialities and in specialities involving the care of children.

## Authorship and Contributions

AA contributed to the study concept and design, data analysis and interpretation, drafting and revising the manuscript, and approving the final version to be published. FM contributed to the study design, data acquisition and analysis, revising the manuscript and approving the final version to be published. EE contributed to the interpretation of data, drafting and revising the manuscript, and approving the final version to be published. AS contributed to data acquisition/analysis and drafting/revising the manuscript.

## Declarations and Conflicts of Interest

The project was funded by the Royal College of Psychiatrists in Scotland after the design stage and before data collection. AA is a member of the Royal College of Psychiatrists in Scotland. FM, AA and AS have worked within NHS Lothian. The funding body had no role in the design, execution or writing up of the study or in the decision to submit the article for publication. All researchers acted independently of the funding body for the purpose of conducting the study.

## Competing interests

All authors have completed the ICMJE uniform disclosure form at [www.icmje.org/coi\\_disclosure.pdf](http://www.icmje.org/coi_disclosure.pdf). Dr. Aboaja reports receiving a grant from Royal College of Psychiatrists in Scotland during the conduct of the study, and has no other competing interests to declare. The remaining authors declare no support from any organisation for the submitted work, no financial relationships with any organisations that might have an interest in the submitted work in the previous three years and no other relationships or activities that could appear to have influenced the submitted work.

## Access to data

All authors had full access to all of the data (including statistical reports and tables) in the study and can take responsibility for the integrity of the data and the accuracy of the data analysis.

## Data sharing

Data sharing: no additional data is made available.

## Acknowledgements

The team wishes to thank all the NHS Lothian pharmacists who collected data from their clinical areas, Dr Rob Waller for his support in identifying a second medical member of the project team and Prof Liz Grant for reviewing the manuscript prior to submission.

## Provenance of paper

The initial idea for this study arose in 2014 after AA found herself in a consultation room with no computer access and an out-of-date edition of the BNF. AA designed the study with contributions from FM. In 2015 funding was secured and approvals received. In 2016 project team recruitment ended. EE and AS conducted the extended literature review. FM and AS

acquired and collated field data in March 2016. AA and AS analysed the data. AA (consultant forensic psychiatrist), FM (clinical pharmacist) and AS (Core Medical Trainee Year 2 Doctor) have experience of working in mental health services. EE is a mixed methods researcher with expertise in patient safety. AA is a global mental health researcher.

## References

1. Leape LL. Error in medicine. *JAMA*. 1994;272(23):1851-7. Available from: <https://jamanetwork.com/journals/jama/article-abstract/384554?redirect=true>
2. Reason J. Human error: models and management. *BMJ*. 2000;320(7237):768-70. Available from: <http://www.bmj.com/content/320/7237/768.full>
3. Mann K, Rothschild JM, Keohane CA, Chu JA, Bates DW. Adverse drug events and medication errors in psychiatry: methodological issues regarding identification and classification. *The World Journal of Biological Psychiatry*. 2008;9(1):24-33. Available from: <http://www.tandfonline.com/doi/abs/10.1080/15622970601178056>
4. Brennan TA, Leape LL, Laird NM, Hebert L, Localio AR, Lawthers AG, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. *N Engl J Med*. 1991;324(6):370-6. Available at: <http://www.nejm.org/doi/full/10.1056/NEJM199102073240604#article>
5. Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of Medication Administration Errors in Hospitals: a Systematic Review of Quantitative and Qualitative Evidence. *Drug Safety*. 2013;36(11):1045-67. Available at: <https://link.springer.com/article/10.1007/s40264-013-0090-2>
6. BMA. British National Formulary 70, 70th edn. BMJ group and Pharmaceutical Press, London. 2016. Available from: <https://www.pharm.reviews/images/statyi/british-national-formulary-2015.pdf>
7. McGettigan P, Golden J, Fryer J, Chan R, Feely J. Prescribers prefer people: The sources of information used by doctors for prescribing suggest that the medium is more important than the message. *British journal of clinical pharmacology*. 2001;51(2):184-9. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2125.2001.01332.x/full>
8. Ward DJ, Slade A, Genus T, Martino OI, Stevens AJ. How innovative are new drugs launched in the UK? A retrospective study of new drugs listed in the British National Formulary (BNF) 2001-2012. *BMJ Open*. 2014;4(10):e006235. Available at: <http://bmjopen.bmj.com/content/4/10/e006235?cpetoc=>
9. Dornan T, Ashcroft D, Heathfield H, Lewis P, Miles J, Taylor D, et al. An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education: EQUIP study. London: General Medical Council. 2009:1-215. Available from: [https://www.gmc-uk.org/FINAL\\_Report\\_prevalence\\_and\\_causes\\_of\\_prescribing\\_errors.pdf\\_28935150.pdf](https://www.gmc-uk.org/FINAL_Report_prevalence_and_causes_of_prescribing_errors.pdf_28935150.pdf)
10. Lawton R, McEachan RRC, Giles SJ, Sirriyeh R, Watt IS, Wright J. Development of an evidence-based framework of factors contributing to patient safety incidents in hospital settings: a systematic review. *BMJ Quality & Safety*. 2012. Available at: <http://qualitysafety.bmj.com/content/21/5/369.long>
11. Patel RK, Sayers AE, Patrick NL, Hughes K, Armitage J, Hunter IA. A UK perspective on smartphone use amongst doctors within the surgical profession. *Annals of Medicine and Surgery*. 2015;4(2):107-12. Available at: [http://www.annalsjournal.com/article/S2049-0801\(15\)00016-3/fulltext](http://www.annalsjournal.com/article/S2049-0801(15)00016-3/fulltext)
12. Prgomet M, Georgiou A, Westbrook JI. The Impact of Mobile Handheld Technology on Hospital Physicians' Work Practices and Patient Care: A Systematic Review. *Journal of the American Medical Informatics Association*. 2009;16(6):792-801. Available at: <https://academic.oup.com/jamia/article/16/6/792/735241>