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Magavern, Emma F.; Hitchings, Andrew; Bollington, Lynne; Wilson, Kurt; Hepburn, David; Westacott, Rachel J.; Sam, Amir H.; Caulfield, Mark J; Maxwell, Simon

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UK Prescribing Safety Assessment (PSA): The development, implementation and outcomes of a national online prescribing assessment

Emma F. Magavern¹  | Andrew Hitchings² | Lynne Bollington³ | Kurt Wilson⁴ | David Hepburn⁵ | Rachel J. Westacott⁶ | Amir H. Sam⁷  | Mark J. Caulfield¹ | Simon Maxwell⁸ 

¹William Harvey Research Institute, Queen Mary University of London, London, UK

²St George's, University of London, London, UK

³UK Prescribing Safety Assessment Partnership, c/o British Pharmacological Society, Medical Schools Council-British Pharmacological Society, London, UK

⁴The University of Manchester, Manchester, UK

⁵Hull York Medical School, Allam Medical Building, University of Hull, Hull, UK

⁶Birmingham Medical School, Institute of Clinical Sciences, College of Medical & Dental Sciences, University of Birmingham, Birmingham, UK

⁷Imperial College School of Medicine, Imperial College London, London, UK

⁸Clinical Pharmacology Unit, Medical Education Centre, Western General Hospital, University of Edinburgh, Edinburgh, UK

Correspondence

Professor Simon Maxwell, The Medical Education Centre, The University of Edinburgh, Western General Hospital, Edinburgh EH4 2XU, UK.
Email: s.maxwell@ed.ac.uk

Abstract

Aims: The United Kingdom (UK) Prescribing Safety Assessment (PSA) is a 2-h online assessment of basic competence to prescribe and supervise the use of medicines. It has been undertaken by students and doctors in UK medical and foundation schools for the past decade. This study describes the academic characteristics and performance of the assessment; longitudinal performance of candidates and schools; stakeholder feedback; and surrogate markers of prescribing safety in UK healthcare practice.

Methods: We reviewed the performance data generated by over 70 000 medical students and 3700 foundation doctors who have participated in the PSA since its inception in 2013. These data were supplemented by Likert scale and free text feedback from candidates and a variety of stakeholder groups. Further data on medication incidents, collected by national reporting systems and the regulatory body, are reported, with permission.

Results: We demonstrate the feasibility, high quality and reliability of an online prescribing assessment, uniquely providing a measure of prescribing competence against a national standard. Over 90% of candidates pass the PSA on their first attempt, while a minority are identified for further training and assessment. The pass rate shows some variation between different institutions and between undergraduate and foundation cohorts. Most responders to a national survey agreed that the PSA is a useful instrument for assessing prescribing competence, and an independent review has recommended adding the PSA to the Medical Licensing Assessment. Surrogate markers suggest there has been improvement in prescribing safety in practice, temporally associated with the introduction of the PSA but other factors could be influential too.

Emma F. Magavern and Andrew Hitchings are joint first authors.

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Conclusions: The PSA is a practical and cost-effective way of delivering a reliable national assessment of prescribing competence that has educational impact and is supported by the majority of stakeholders. There is a need to develop national systems to identify and report prescribing errors and the harm they cause, enabling the impact of educational interventions to be measured.

KEYWORDS

assessment, doctor, error, medication safety, medicine, pharmacist, prescribing

1 | INTRODUCTION

The UK Prescribing Safety Assessment (PSA) is a joint initiative by the British Pharmacological Society (BPS) and Medical Schools Council (MSC) and is to date the only national assessment sat by all UK medical students.^{1,2} It was developed after a study commissioned by the General Medical Council (GMC) found that nearly 1 in 10 hospital prescriptions contained errors.³ The PSA assesses the skills, judgement and knowledge required to prescribe and supervise the use of medicines.⁴ The UK was the first country to implement a national prescribing assessment of this kind. It has been voluntarily adopted by all UK medical schools and run successfully, at scale, for 10 years.^{2,5} Medical schools are currently responsible for determining locally when and how the PSA is administered in their programmes, the implications of the results and the associated governance processes. While this provides local flexibility (within some constraints set nationally), it inevitably results in some heterogeneity. Postgraduate medical training in the UK begins with the Foundation Programme, a 2-year programme directly following medical school graduation. These recently graduated doctors practise under supervision and are responsible for much of the prescribing in hospitals. Since 2016, all Foundation Year 1 (FY1) doctors in the United Kingdom (UK) have been required to pass the PSA to progress in their training to Foundation Year 2 (FY2).¹

In the 10 years since the PSA was introduced, there have been changes to the delivery of medical education and training; drug developments; advances in multidisciplinary team working; electronic prescribing; and utilization of clinical decision support tools, all of which could affect the relevance and utility of the PSA. Many novel therapeutics have been introduced, including biologics, and the areas of antimicrobial stewardship, polypharmacy and deprescribing receive greater attention. A national Medical Licensing Assessment (MLA) will be introduced in 2024.⁶ This will standardize UK medical school exit examinations for students graduating from 2025 onwards and replace the Professional and Linguistic Assessments Board (PLAB) for international medical graduates (IMGs). The introduction of the MLA has prompted the joint Medical Schools Council and British Pharmacological Society group to commission an independent review of the PSA, its performance and to consider its place in future undergraduate and postgraduate education and licensing. This article coincides with the publication of an independent review of the PSA (the Dacre Review) and reports our experience of developing and implementing the assessment.⁷ We describe its academic characteristics, psychometric properties and the

What is already known about this subject

- Newly graduated doctors write most of the prescriptions for inpatients in UK hospitals, but previous studies suggest that around one in 10 of their prescriptions contain errors. The ability to prescribe safely and effectively is identified by the General Medical Council (the UK medical regulator) as a key requirement for newly qualified doctors.
- Medical schools have taken different approaches to the teaching and assessment of prescribing skills, and not all require this to be summatively assessed before graduation. Assessment of prescribing competence is complex because of the breadth of tasks undertaken by prescribers, the diversity of prescribing systems used, and the challenge of consistently marking large numbers of multipart prescriptions.
- The Medical Schools Council and the British Pharmacological Society established the UK Prescribing Safety Assessment in response to the reported challenges with prescribing quality and the consequent risk to patient safety. The Prescribing Safety Assessment (PSA) is a 2-h online assessment of prescribing competence which, since 2016, all Foundation Year 1 doctors are required to have passed before progressing to Foundation Year 2.

What this study adds

- This report demonstrates the feasibility, high quality and reliability of an online prescribing assessment, delivered at scale and uniquely providing a measure of prescribing competence against a national standard. The standard is met by most, but not all, candidates on their first attempt at the assessment.
- Most institutional and individual stakeholders responding to a national survey agree that the PSA is a useful instrument for assessing prescribing competence, and an independent review has recommended adding the PSA to the Medical Licensing Assessment.
- Surrogate markers suggest an improvement in prescribing safety in practice, which is temporally associated with the

introduction of the PSA but other factors may also be contributing to this pattern. National standards and systems should be developed to identify, collect, and transparently report prescribing errors and the harm that results from these, enabling the impact of educational interventions to be measured.

performance of candidates from UK medical and foundation schools. We also describe markers of its impact, drawing on responses to a national survey undertaken by the independent review, and surrogate markers of prescribing safety in UK healthcare practice.

2 | METHODS

2.1 | Assessment design

A full description of the PSA assessment structure, item and paper development and approval, standard setting, assessment delivery, post-assessment review and feedback (to and from candidates and their institutions) is provided in Appendix S1. Briefly, the assessment is administered using an online (web-based) platform. All items contain a clinical vignette, blueprinted to sample across diverse speciality areas. The largest source of marks (80 marks, [40%]) is from items that require responses in the form of prescriptions (using a mixture of inpatient regular, once-only and IV infusion prescription templates as well as primary care prescriptions). These are marked automatically, against a predefined grid of drug and dosage regimens envisaged as potential answers by question writers and the Assessment Board. Answers that cannot be marked from this grid are scored manually, and these scores are added to the answer grid for future use. Other item types require numerical responses (calculations, 16 marks [8%]) or identification of the best answer from a list of options (104 marks [52%]).

2.2 | Analysis of candidate and assessment performance

Every year, several PSA papers, each with their own criterion-referenced pass mark, are administered on different dates, to cater for the needs of all UK medical and foundation schools. Performance on the assessment is scored on a range from 0 to 200. To enable comparisons of scores from papers with different pass marks, calibrated scores (scale range 0–200, pass mark set at 100) were calculated by piecewise linear scaling. Calibrated scores were judged to be sufficiently normally distributed to enable parametric statistical testing to be undertaken, using visual checking of histograms and q-q plots in view of the large data sets being analysed. The significance of

variation in scores between schools was evaluated by one-way ANOVA. Psychometric analysis was undertaken using classical test theory and item response theory, the methods of which are described in the 2022 annual psychometric report (Appendix S2). Analyses were performed in Excel 365 and Stata v16, and data are presented as mean and standard deviation (SD) unless otherwise stated.

2.3 | Feedback from candidates after examination sittings

Immediately following each examination event, candidates are presented with a questionnaire which is completed within the online examination platform. This incorporates 5-point Likert scales to measure: perceived preparedness for the exam, the online delivery platform and self-reported estimates of the number of prescriptions written as a student. Free-text items capture comments related to the examination and prescribing education.

2.4 | Dacre Review evidence collection and analysis

Multiple strands of novel data contributing to the Dacre Review from the MSC-BPS data set and provided by the General Medical Council are presented here with permission. The methods used to generate this evidence are detailed in the panel's report.⁷ Briefly, an online survey collected responses from individuals and institutions involved with prescribing education and assessment, including students, educators, practitioners and healthcare and university leaders. The survey was openly advertised to students, faculty and clinicians via medical school assessment leads and the MSC website. Further evidence provided to the review from NHS National Reporting and Learning System (NRLS) open access longitudinal data and the GMC are also reported here, with permission.⁸

3 | RESULTS

3.1 | Implementation

The PSA is taken by approximately 8000 candidates annually. In 2022, these included medical students studying for UK medical degrees (~94%), Foundation Programme doctors who did not pass the assessment before graduation (~1%) and international medical graduates in foundation training (~5%). Over 70 000 medical students and 3700 foundation doctors have participated in the PSA since its inception in 2013.

The number of participating schools, candidates and pass rates, as well as the pass marks and reliability statistics of the papers, are presented in de-identified format in Table 1.

All single-best-answer and numerical-response items were marked automatically and marking of prescription-writing questions

Year	Schools	Students	Papers	Pass mark	Pass rate	Cronbach's α
PSA2013	30	4937	2	64.5	94%	0.73–0.79
PSA2014	31	7144	5	68.5–73.3	94%	0.67–0.74
PSA2015	31	7576	4	62.5–64.0	91%	0.74–0.78
PSA2016	31	7343	4	62.0–65.5	95%	0.74–0.77
PSA2017	31	7147	4	58.5–62.0	96.5%	0.74–0.77
PSA2018	33	6923	4	61.0–65.0	95.8%	0.69–0.74
PSA2019	33	7524	4	62.5–63.0	96.6%	0.80–0.83
PSA2020	34	7606	6	57.0–62.8	92.4%	0.72–0.80
PSA2021	34	7579	3	60.5–63.5	93.3%	0.74–0.81
PSA2022	34	8078	4	63.0–65.5	94.6%	0.78–0.81

TABLE 1 The number and performance of candidates from 2013 to 2022. These data are restricted to first sit attempts only, by students attending institutions awarding UK medical degrees. PSA2020 and PSA2021 were sat during the Covid-19 pandemic. Over 90% of first-time test takers pass the exam standards annually. There are multiple papers each year (details in Appendix S1).

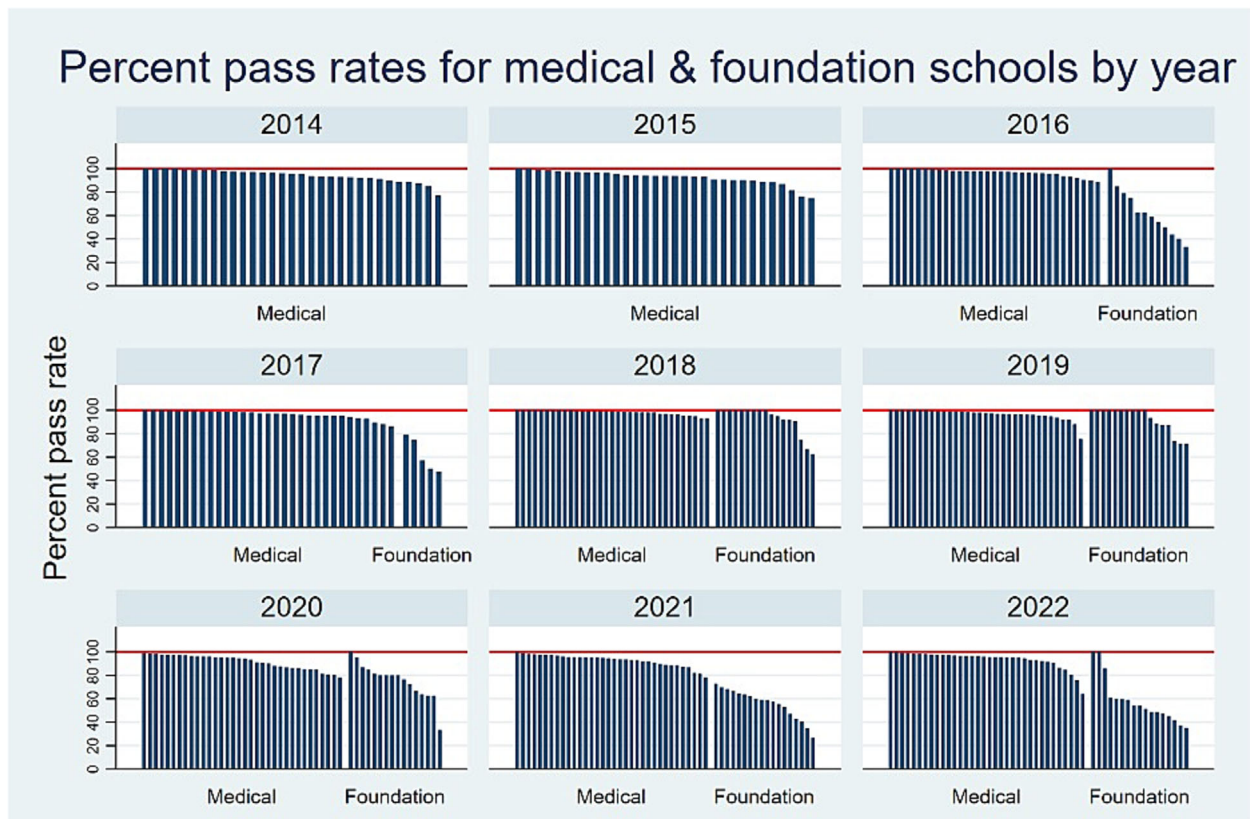


FIGURE 1 Pass rates for anonymized medical schools and anonymized foundation schools 2014–2022. The first foundation sitting was in 2016. The red line indicates 100% pass rate. Medical school cohorts perform better annually when compared with foundation school cohorts. There is significant variability in both medical school and foundation cohort performances.

was largely automated. For example, in February 2022 (the first and largest event of the year), of 40 392 responses to 26 prescription-writing items administered in four papers, 38 491 (95.3%) were marked automatically, based on the predefined answer grid. The answers not in the predefined grid required consultation with the Assessment Board prior to manual scoring. All scores were finalized within 10 days of the assessment date. The results were released to schools and students within 3 weeks of the examination following psychometric review and ratification by the Joint MSC-BPS PSA Board.

3.2 | Performance of candidates and schools

Numbers and performance of candidates at first attempt since initial piloting of the PSA in 2013 are presented in Figure 1. The summative or formative status of the PSA is determined locally, and overall, performance is higher in schools where the PSA is used as a summative assessment ($P < .001$). By way of illustration using 2022 data, this inter-institution variation is presented in Figure 2. Pass rates and median scores are higher among candidates taking the PSA in medical school as compared to those taking it in the Foundation Programme ($P < .001$, Figure 3).

FIGURE 2 Box plots of calibrated marks for each UK medical school (anonymized) split by the summative vs. formative (zero stakes) environment in which the assessment was taken by candidates. Candidates who take the PSA in a summative setting consistently outperform those who take the assessment in a formative environment.

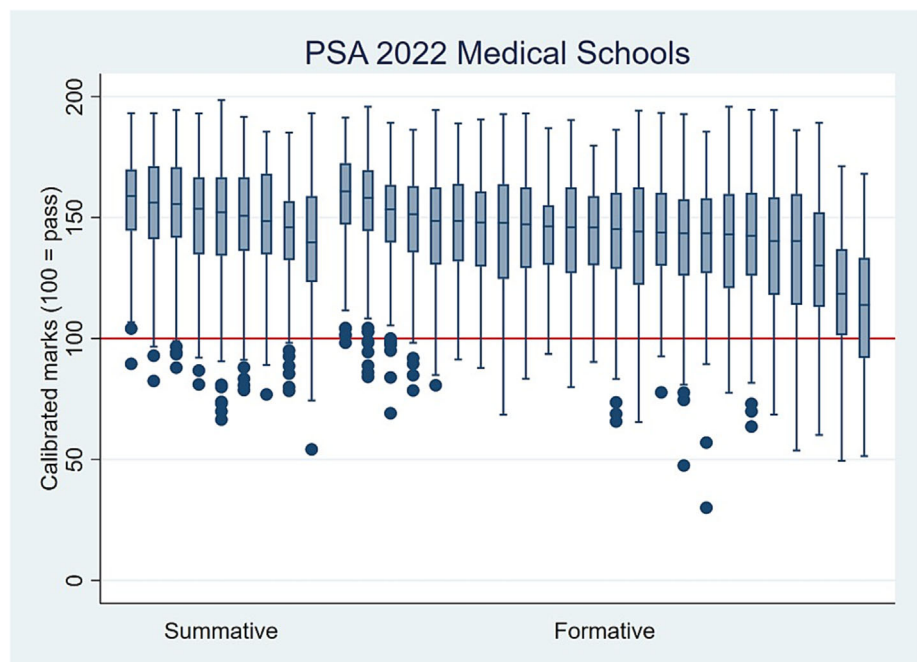
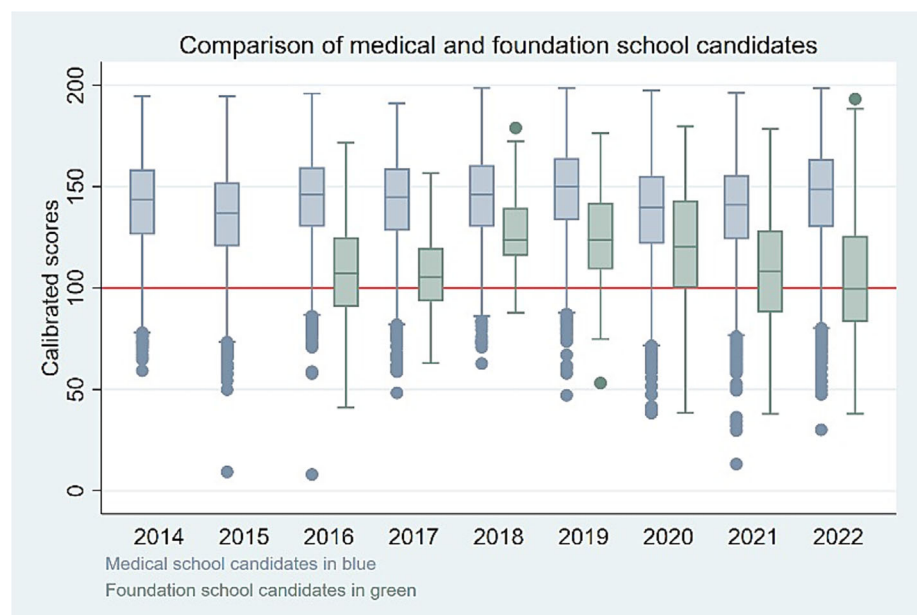


FIGURE 3 PSA calibrated scores: comparison of medical and foundation school candidates. Medical school cohorts consistently perform significantly better compared with foundation school cohorts.



3.3 | Psychometric characteristics of the assessment

A psychometric analysis is undertaken after each annual cycle of the PSA. The latest annual psychometric report is provided as Appendix S2.

3.3.1 | Assessment of a single latent trait

A prerequisite for many analyses of assessment performance is the assumption that its constituent items measure a single latent trait (plausibly ‘prescribing skill’, in the case of the PSA). Factor analyses,

performed on all papers over the years in which the PSA has been administered, suggests that it measures one principal factor, with most items in the assessment contributing information relevant to that factor. This is described more fully for the most recent year in Appendix S2.

3.3.2 | Internal consistency

The internal consistency of PSA papers, as estimated by the Cronbach's alpha reliability coefficient, ranged between 0.78 and 0.81 in the most recent year reported. Reliability coefficients over the last

10 years of assessment tests are shown in Table 1. The average standard error of measurement (SEM) for PSA papers since 2020 (from which time it has been routinely included in annual psychometric reports) is 5.2%. It ranged from 3.9% to 4.4% in the last academic year (see Appendix S2).

3.4 | Impact

3.4.1 | Candidate survey results

Aggregated responses from all candidates completing the post-assessment survey between 2020 and 2023 are shown in Table 2. Most respondents (59%) agreed that the PSA is an appropriate test of the prescribing skills expected of a medical student at graduation. They agreed that the information provided to them prior to the exam, available from the PSA website, was helpful (75%), and most reported that the online interface was easy to use (78%). Fewer than half of candidates (42%) agreed that their course had prepared them adequately to tackle PSA questions, and only about a quarter (24%) agreed that the time provided to answer questions was sufficient.

In response to the free-text question ‘Were any particular items unclear or unreasonably difficult?’, of 13 477 responses, 2656 (19.7%) referred to questions being ‘difficult’ (1767), ‘hard’ (709), ‘challenging’ (144) or ‘tough’ (36). In contrast, 2757 respondents (20.4%) indicated that they could not recall any unclear or unreasonable questions, with the single most common response to this question being ‘no’ (952 responses, 7%). This aligns with answers to the closed-response item, ‘The questions in the assessment were clear and unambiguous’, to which 55.9% agreed. Asked ‘Are there any

ways in which the online PSA could be improved?’, 4826 of 12 315 responses (39%) requested more time, and 1701 (13.8%) requested more practice material, though 2359 (19.2%) answered this question with ‘no’, ‘none’, ‘N/A’ or similar.

Candidate responses to the question regarding their prescribing activity during training were variable, with a substantial proportion (40%) reporting that they had written five or fewer prescriptions on a prescription chart.

3.4.2 | Dacre Review survey results

Responses were received from 595 individuals and 70 organizations. Individual respondents included academics from higher education institutions (HEIs); healthcare practitioners across a range of professions, specialties and grades; and medical students and foundation doctors.

Of 33 responses received from foundation doctors, most (72%) agreed that the PSA was a useful assessment tool and that it should continue in its current form (54%).

Free-text comments echoed concerns from the candidate survey about the time available to complete questions in the PSA. Support for the national assessment of prescribing was voiced by several foundation doctors; responses to a question suggesting removal of the PSA and/or reducing prescribing assessment raised concerns about negative impacts on patient safety and one commented that this ‘would be a huge mistake’. Responses to questions asking about PSA contributions to FY1/2 safe prescribing included expressions of greater confidence and familiarity with prescribing resources and with preparation for F1 work. Representative responses included: ‘Encourages students to learn and be confident with the use of the

TABLE 2 Candidate responses to the Prescribing Safety Assessment post-assessment survey. Aggregated data from 37 596 responses received from all assessment events between 2020 and 2023. Data presented are counts and percentages, and the median response for each item is highlighted in bold.

Survey question	Responses—N (%)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
This assessment was an appropriate test of the prescribing skills expected of a medical student upon graduation	1541 (4%)	4607 (12%)	9324 (25%)	17 800 (47%)	4324 (12%)
My course prepared me for the content of the questions in this assessment	3016 (8%)	7433 (20%)	11 387 (30%)	12 827 (34%)	2933 (8%)
The time provided for answering the questions was sufficient	9014 (24%)	12 679 (34%)	7036 (19%)	7270 (19%)	1597 (4%)
The layout and presentation of the questions were easy to follow	956 (3%)	2283 (6%)	6245 (17%)	19 682 (52%)	8430 (22%)
The online interface was easy to use	1089 (3%)	1799 (5%)	5502 (15%)	19 722 (52%)	9484 (25%)
The information about the PSA ^a was helpful	862 (2%)	1805 (5%)	6629 (18%)	19 319 (51%)	8981 (24%)
The questions in the assessment were clear and unambiguous	1091 (3%)	4583 (12%)	10 916 (29%)	17 080 (45%)	3926 (10%)

^aAvailable prior to the event from prescribingsafetyassessment.ac.uk.

BNF', 'How to use the BNF in a speedy manner', 'It was a huge help to prepare me for f1'.

Several felt that the PSA had helped drive investment in related teaching while they were at their medical schools: 'I think we got a lot more regular teaching on prescribing from Year 1 upwards as a result of the PSA'; 'large parts of curriculum dedicated to PSA and prescribing essentials that may well be overlooked'.

Seventy responses were made on behalf of organizations. These included medical schools, public bodies including the General Medical Council, Health Education England and the Royal College of Paediatrics and Child Health. Eighty-four per cent of responding institutions agreed that the PSA was a useful assessment of medical student prescribing competence, and most (60%) agreed that the PSA should continue in its current form.

Many respondents commented on possible amalgamation of the PSA with the UK MLA. Some commented that care would be needed to avoid duplication of assessment. Others highlighted the limitations of the MLA assessments, with reliance upon single-best-answer (SBA) question design and the closed-book format of the Applied Knowledge Test, compared with the comparative complexity and authenticity of competency-based PSA examination.

Many free-text comments from representatives proposed that the PSA had raised awareness of prescribing competence and driven undergraduate teaching in this area, but that any impact on prescribing practices was difficult to quantify and largely anecdotal.

Medical student responses broadly concurred with the organization responses, and were overwhelmingly supportive of the PSA.

Seventy-five per cent of medical student respondents (136/180) thought the PSA was a useful resource in assessing students' competency in the safe and effective prescribing of medicines, and 62% (98/158) thought it should continue.

3.4.3 | Preparation of graduates for prescribing

Trends in data made available by the GMC from the National Training Survey data show that during the lifetime of the PSA since 2016, trainees have reported increasing confidence longitudinally in preparedness to prescribe, contrasting with other skill areas assessed by the survey (Figure 4).⁹ The confidence in prescribing has increased steadily from 75.1% in 2015 to 81.6% in 2021.

3.4.4 | Changes in national indicators of poor prescribing

The NRLS collates data related to patient safety incidents since 2003. This publicly available data set shows that, although incident reporting relating to prescribing has generally increased over time, there is a recent consistent decline in the proportion of medication-related patient safety incidents reported since 2018 (Figure 5). This refers to incidents involving not only prescribing errors, but also errors in transcribing, dispensing or administering medicines.

The GMC provided data to the Dacre Review regarding longitudinal referrals to the regulator due to inappropriate

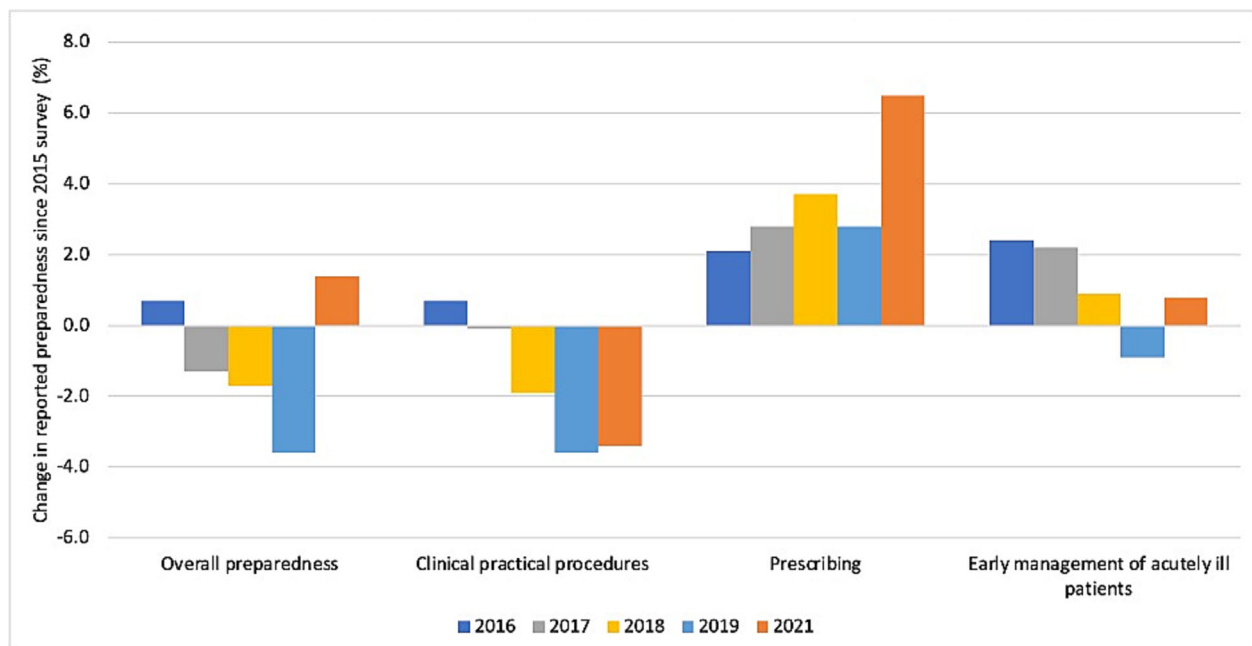


FIGURE 4 Changes in self-rated preparation of medical graduates (GMC National Trainee Survey 2015–2021). Confidence in preparation to prescribe has increased since implementation of the PSA, in contrast to other competency domains.

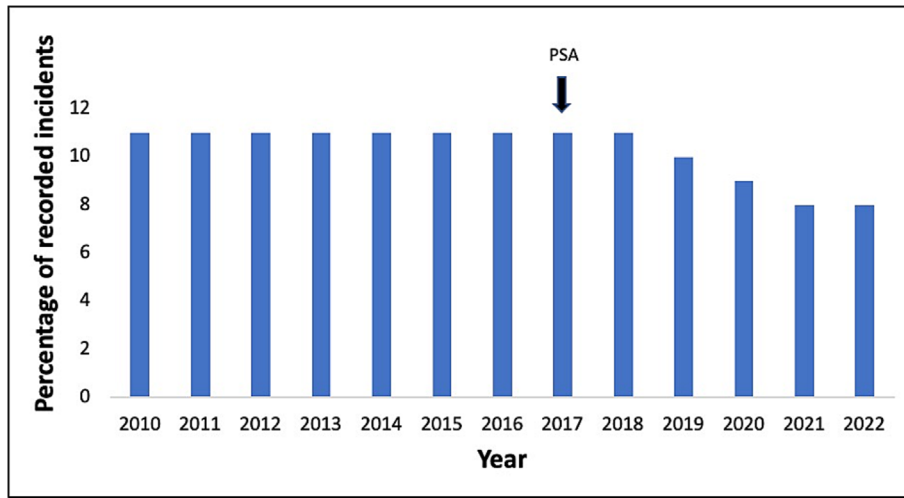


FIGURE 5 Percentage of nationally reported patient safety incidents due to medications in England, 2010–2022. The proportion of medication-related safety incidents has been decreasing since introduction of the PSA. The introduction of the PSA as a mandatory requirement to pass from FY1 to FY2 occurred in August 2016, therefore 2017 would be the first year in which all FY2 doctors would have taken the PSA, and all FY1 doctors would be preparing for the PSA. Data from the National Reporting and Learning System national patient safety incident reports (publicly available quarterly data reports and archives of reports published by NHS England) (<https://www.england.nhs.uk/patient-safety/national-patient-safety-incident-reports/>). Data are presented as percentage of safety incidents reported rather than number of incidents reported due to consistent trends published by NRLS showing consistently increasing incident reporting over the last 20 years.

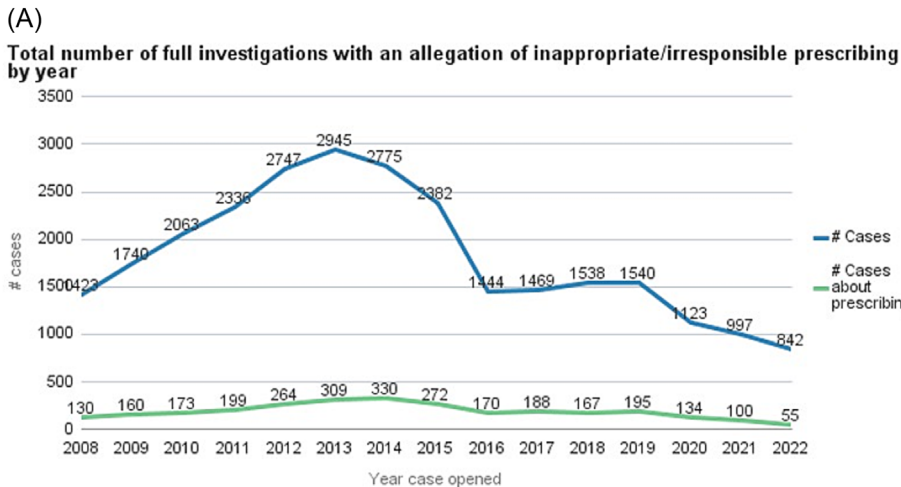
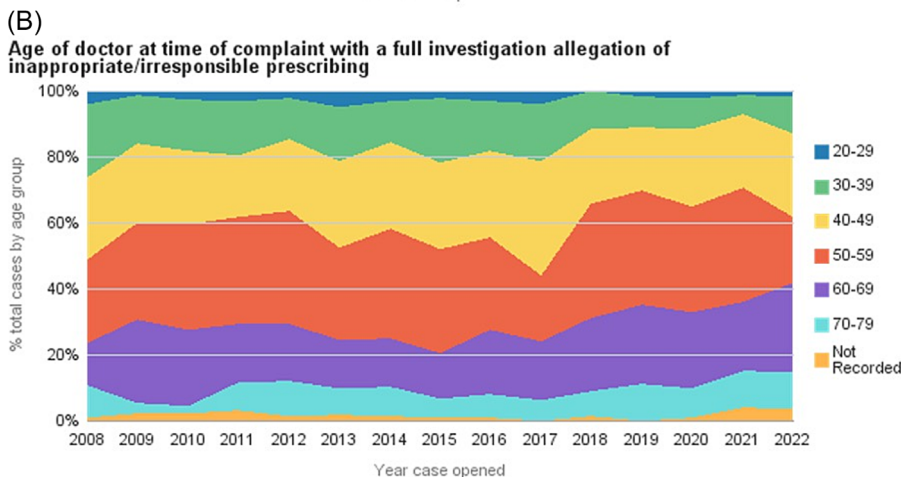


FIGURE 6 Longitudinal trends in investigations by the GMC. (A) All investigations by the GMC (blue) and those due to prescribing errors (green), 2008–2022. Prescribing related referrals account for only approximately 10% of referrals annually and have been decreasing since 2015, during the lifetime of the PSA. (B) Age of doctors referred for investigation. Most of the referrals for inappropriate prescribing are for older doctors rather than 20–29-year-old doctors (most likely to be newly qualified).



prescribing. Prescribing-related referrals make up a minority of referrals and have been decreasing for several years (Figure 6A). Referral of doctors aged 20–39 years old suggest a decreasing trend for referral since the inception of the PSA (Figure 6B). The highest percentage of prescribing-related referrals to the regulator involved older doctors.

4 | DISCUSSION

The PSA is an online assessment of prescribing competence. The data presented here demonstrate the strong educational foundations and national feasibility of implementing this assessment at scale, including automated marking of free-text prescriptions across diverse areas. The criterion-referenced pass standard is achieved by most (91%–97%), but not all, candidates at first attempt. The proportion not achieving the pass standard varies significantly between medical schools and is higher among candidates taking the assessment in schools in which it has a formative rather than summative status. Pass rates are significantly lower among candidates taking the assessment in the first year of the Foundation Programme, a cohort that is likely to include many IMGs. This has led the Dacre Review to conclude that all final-year students should complete the PSA as a summative assessment prior to clinical practice, as prescribing safety is a core skill from day one of the Foundation Programme.⁷ Therefore, the Dacre Review recommends that passing the PSA, either as a stand-alone exam or part of an umbrella Medical and Prescribing Licensing Assessment (MPLA), in combination with the MLA, should be a requirement for entry to medical practice in the UK.⁷ This structure would further standardize preparation to prescribe within the UK and ensure that competency in this important skill is shifted to pre-graduation, prioritizing patient safety.

The extent to which the PSA simply measures prescribing competence, as opposed to driving it, is open to debate. However, assessment is widely understood to drive learning, and stakeholder feedback gathered in the independent Dacre Review suggests that the PSA has contributed towards increased focus on prescribing in the undergraduate curriculum.^{7,10} It has also shifted the paradigm in UK medical schools from a near-complete reliance on SBA questions in final-year written assessments. While an advance over true/false questions, SBA questions have long been recognized to lack authenticity, and to suffer from cueing effects.^{11,12} SBA questions are known to under-detect prescribing errors.¹³ In contrast, open-ended prescribing and calculation questions that test competency do not incorporate answer cues, and better align with real-world practice. These question types, together with a restricted open-book format, encourage preparation that is better aligned with both clinical practice and the aims of undergraduate medical curricula. Likewise, the relatively open-ended marking matrices acknowledge uncertainty and breadth of practice far better than can be done in SBA items. Such an approach may also provide insight into prescribing errors not identified by SBA questions. Through increasing the authenticity of the assessment approach, the PSA encourages medical schools to

train, and candidates to learn, in ways that are better aligned with real-world healthcare practice.

While the educational foundations of this assessment appear sound, and its reception by stakeholders has been positive, there are unresolved questions about how it is best used. The significant differences in PSA performance between cohorts at schools where the assessment is summative rather than formative suggest, perhaps intuitively, that low-stakes assessment provides less of a stimulus to learning. Of concern, graduates from schools in which the assessment is taken formatively, who have not met the standard of competence defined by the PSA, are able to enter practice and prescribe medicines in their first year of training. This is because the requirement to pass the PSA is currently not enforced until progression to the second year of the Foundation Programme. Those who take the PSA during the Foundation Programme are therefore a mix of UK graduates who have not passed the PSA at medical school, and IMGs entering the first year of the Foundation Programme. IMGs come from diverse educational and experiential backgrounds, and may lack familiarity with UK prescribing practices, therapeutic nomenclature, guidelines, or resources, such as the British National Formulary (BNF). In this context, the lower pass rate among Foundation Programme doctors may be expected. However, it raises concerns that IMGs entering the second year of the Foundation Programme may also be underprepared for UK prescribing practice, but this is not measured as they are not subject to the requirement to pass the PSA. The Dacre Review recommends that prescribing should be assessed as a standardized part of medical licensure examination, a conclusion with which we wholeheartedly agree. Similar arguments may be made for new prescribers from nonmedical professions, where a standardized, summative assessment of prescribing competence may be equally valuable. Pilot projects have already been completed with pharmacists and there is scope to increase PSA availability and adapt it in keeping with increasing numbers of nonmedical prescribers.¹⁴

Survey data from the Dacre Review show there is broad recognition that clinicians are required to write more prescriptions, and be familiar with more therapeutic options, than ever before, and do this in an increasingly complex and challenging patient and workplace landscape.^{4,7} Our ageing population is increasingly burdened with multimorbidity and polypharmacy. In this context, and with increasing reporting volume of patient safety incidents since the inception of the NRLS in 2003, the consistent decline in proportion of medication-related patient safety incidents reported since 2018 (Figure 6) is encouraging, if surprising. The decline in normalized medication-related harms reported is likely a reflection of multifactorial interventions to improve safety. However, the steady rate prior to the standardized adoption of the PSA as a national requirement for training, and consistent downward trend thereafter, offers a tantalizing but unprovable suggestion that prescribing assessment may be one contributory factor.

Our inability to causally link this educational initiative, like so many others, with real-world healthcare outcomes is in large part due to a lack of data on prescribing errors and the harm they cause. This

conspicuous omission is in part due to disagreement on what data to collect. Several prospective studies have recorded errors which are intercepted before reaching a patient.^{15,16} Conversely, only reporting those errors which result in patient harm is unlikely to result in a full understanding of the scope of prescribing errors. There are also different data collection systems in the four UK nations; for example, the NRLS only collects data for England and Wales. To track dynamic changes in iatrogenic prescribing-related harm, and thereby ensure we are protecting patients, data collection systems must be redesigned to provide more robust data. This fundamentally rests on a common definition of a prescribing error.

5 | CONCLUSION

We describe the development and implementation of a national assessment of prescribing competence. We demonstrate the feasibility of nationally assessing prescribing skills across diverse areas using an online platform with largely automated marking, delivering results to UK-wide medical schools, foundation schools and candidates within days of administration. The assessment provides a reliable and stable measure of prescribing competence before students enter practice, measured against a national standard. Most, but not all, candidates achieve this standard at first attempt. Concerns around the time allotted to complete the assessment were frequently voiced and this should be further assessed. Stakeholders, including candidates, educators, clinicians and educational and healthcare organizations, endorse the value of the assessment in measuring prescribing competence and support its continued use. While surrogate indicators of prescribing safety in practice suggest a pattern of improvement that is temporally associated with the introduction of the PSA, it is impossible to ascribe causality. The Dacre Review recommendations to standardize PSA delivery nationally as a requirement prior to clinical practice are pragmatic, supported by multiple streams of evidence and sustainably prioritizes patient safety. There is an imperative to develop data collection processes to track prescribing errors and harms longitudinally, so that the impact of educational initiatives such as the PSA can be measured.

AUTHOR CONTRIBUTIONS

Emma F. Magavern, Andrew Hitchings, Lynne Bollington, Kurt Wilson, David Hepburn and Simon Maxwell undertook the presented analyses and drafted the manuscript. All authors gave feedback on and edited the manuscript. All authors approved the final version of the manuscript prior to submission.

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CONFLICT OF INTEREST STATEMENT

Lynne Bollington is remunerated for her work on standard and question setting. With Simon Maxwell, David Hepburn, Andrew Hitchings, Kurt Wilson, she assembled and submitted a dossier of evidence from the Joint MSC-BPS Master data set on the PSA. Emma Magavern provided secretariat support to the Dacre Review but only worked on this publication after completion of the report. Rachel J. Westacott and Amir H. Sam are on the board of the Medical Schools Council Assessment Alliance.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Emma F. Magavern  <https://orcid.org/0000-0003-0699-6411>

Amir H. Sam  <https://orcid.org/0000-0002-9599-9069>

Simon Maxwell  <https://orcid.org/0000-0002-3032-7237>

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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