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Healthcare ethics and artificial intelligence: a UK doctor survey

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ABSTRACT

Objectives To survey UK doctors on their uses of artificial intelligence (AI) and of their views on the ethics and regulation of AI in healthcare.

Design Anonymous cross-sectional e-survey.

Setting An online survey of UK General Medical Council (GMC) registered doctors.

Participants 272 individuals.

Main outcome measures Likert-scale responses to questions covering personal use of AI, concerns about AI, requirements for introduction of AI and views on necessary AI regulation in healthcare.

Results Most doctors rated themselves as slightly or moderately knowledgeable about AI, with men rating their knowledge levels higher than women. Doctors in training are more likely to have used AI than doctors after training. 37% of doctors who use AI reported using AI to help write the required reflective pieces for their portfolio. Doctors reported concerns about AI regarding patient safety and patients' right to confidentiality. They also expressed a strong desire for further regulation of AI in healthcare and, specifically, for their professional bodies to draft guidelines for the use of AI by doctors.

Conclusions This study provides useful insights into UK doctors' uses of AI in healthcare and their opinions on its introduction and regulation. It provides a case for guidance on the use of AI in the reflective practices of doctors and for further evaluation of doctors' concerns about AI in healthcare. We call on doctors' professional bodies (GMC, BMA and royal colleges) to draft professional guidance for doctors using AI.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study is an anonymous cross-sectional e-survey of UK General Medical Council-registered doctors.
⇒ The study size is adequate, but a larger sample size would have allowed for more in-depth multivariate statistical analysis.
⇒ This study is not comparative across different types of artificial intelligence, but aims to provide a snapshot of the current situation.

INTRODUCTION

Artificial Intelligence (AI) is being used and developed for a variety of healthcare uses with the potential to improve various aspects of healthcare from diagnostics to treatments.[1] Until recently, this has primarily been bespoke AI systems for diagnostic advice or therapy choice based on the analysis of patient notes and lab results and AI systems for image analysis. Recently, the release of ChatGPT's chatbot to the public in late 2022 and the release of other large language models (LLMs) have enabled everyone who had access to the internet access to the power of generative AI.[2] These LLMs gained a lot of attention from doctors after ChatGPT was able to pass the US Medical Licensing Examinations.[3 4]

While the power of these LLMs may help doctors in their clinical practice, there are risks to this technology. Some of these risks include risks around breaking confidentiality, legal responsibility, informed consent, bias, enabling academic malpractice and risks to patients.[5–8]

While there are a large number of papers published on the use of AI by doctors before these new types of generative AI models and LLMs became readily available, these earlier studies may not reflect current uses and attitudes.[9–15] Due to these new types of AI being so readily available and the potential multitude of uses in healthcare and by doctors, we designed this research survey to understand how doctors in the UK are using AI after the easy availability of LLMs and their opinions on its use, their concerns, how they think AI should be used in healthcare and their views on the regulation of AI in healthcare. The study is not comparative across different types of AI, but aims to provide a snapshot of the current situation.

METHODS

Study design

This is an anonymous cross-sectional e-survey containing five sections, demographics, use of AI, concerns about AI, requirements for introduction of AI and views on necessary AI regulation in healthcare. The survey questionnaire was developed after a literature review following the Checklist for Reporting

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Results of Internet E-Surveys guidelines: online supplemental material 3.

Questions about the use of AI, concerns about AI, requirements for introduction of AI and views on necessary AI regulation were developed based on a review of the literature and informal discussions with a number of doctors. The response options for the questions in these sections are all five-point Likert scales from 'strongly disagree' to 'strongly agree'.

Before deploying the e-survey, a pilot test was conducted with a sample of ten participants. This allowed for the identification of potential issues with question clarity, flow and overall survey structure. Feedback from participants informed necessary revisions to optimise the questionnaire for ease of use.

For the survey administration, we employed the online platform Qualtrics. The questionnaire deliberately excluded the collection of personal identifiable information or IP addresses to safeguard participant anonymity and privacy and decrease the risk of social desirability bias in the responses. A copy of the questionnaire is available in the online supplemental material 4.

Participants were provided with comprehensive information about the survey's purpose, the assurance of anonymity and confidentiality and the voluntary nature of participation. This information was presented at the start of the survey through a participant information sheet (PIS), requiring participants to confirm their understanding and provide consent to proceed. The PIS is available in online supplemental material 5.

Participants and recruitment

The survey was conducted online from 10 January 2024 to 1 March 2024. Participants accessed the survey through a QR code or a web link provided in our promotional materials. Outreach efforts included social media campaigns targeting Facebook, WhatsApp and Twitter groups for UK doctors. Direct email invitations were sent to institutions encouraging them to share the survey with their members. We invited all UK medical royal colleges to participate. A list of participating societies and persons who distributed the survey can be found in online supplemental material 6.

The inclusion criteria are that participants (1) confirm that they read and understood the PIS and gave informed consent, (2) complete the survey, that is, get to the end of the survey and have answered at least some questions in each section and (3) confirm that they are UK-based General Medical Council (GMC) registered doctors.

Analysis

A statistical analysis plan was developed prior to data analysis: online supplemental material 7. This plan was reviewed by a medical statistician to ensure robustness and accuracy.

All analyses were conducted in SPSS 29.0. Unweighted data were used to maintain simplicity in the analysis approach.

Missing data were excluded question by question.

Analyses of the relation between background variables and responses were performed using non-parametric tests since the data are ordinal and, for most questions, highly skewed. For independent variables without inherent ranking, we used Mann–Whitney U tests, and for independent variables with ranking, we used Jonckheere–Terpstra tests for trend. Where the dependent variable was categorical, for example, use or non-use of AI, we used χ^2 tests.

We constructed three simple, summative scales from the responses to questions about concerns, requirement and regulation, respectively. The construct validity of the scales was analysed by calculation of Cronbach's alpha.

The significance level was set at the conventional 0.05, with Bonferroni correction for multiple significance tests giving an effective significance level of 0.0071. All significant results after Bonferroni correction are reported below.

Patient and public involvement

There was no patient or public involvement in this study.

RESULTS

Demographics

We recorded 272 responses to the survey. Of these, 61 respondents did not meet the inclusion criteria—2 respondents were excluded for not accepting the terms outlined in the PIS, 19 for not being UK-based GMC-registered doctors and a further 40 for incomplete

Table 1 Respondents categorised by medical specialty

Specialty	Frequency	Percentage
Foundation doctor	64	32
GPs	10	5
Anaesthetics/intensive care medicine	21	10
Emergency medicine	5	3
Obstetrics and gynaecology	3	2
Ophthalmology	0	0
Paediatrics	8	4
Pathology	6	3
Internal medicine (including all subspecialties)	37	18
Psychiatry	21	10
Public health	3	2
Radiology	7	3
Surgery (including all subspecialties)	17	8
Other	1	0
Total	**203**	**100**

GPs, general practitioners.

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surveys. This left 211 eligible participants who completed the questionnaire (completion rate=78%).

The demographic distribution showed an equal gender representation: male (50.5%), female (45.7%), non-binary (1.0%) and those who chose not to disclose their gender (2.9%). To simplify gender-based data analysis, non-binary and prefer not to say categories were excluded in the analysis due to limited responses.

The average age was 39 years, ranging from 20 to over 70. The average years since graduation were 15 years, covering a spectrum from recent graduates to those graduating over 30 years ago. For the statistical analysis, 'within the last year' and '1–5 years' were combined into '0–5 years' (40.0%), and '6 or more years' constituted the other category (60.0%).

Survey participants were categorised into two groups for the statistical analysis based on their title: 'in training' (45.0%) and 'after training' (55.0%). 'In training' encompassed doctors actively pursuing specialisation, while 'after training' included doctors who have completed their specialisation.

Doctors from diverse specialties participated. Specialties were not combined for analysis due to result heterogeneity, and a comprehensive breakdown is available in table 1.

Use of AI

Most respondents consider themselves either slightly (44.3%) or moderately (31.4%) knowledgeable about AI, with a smaller proportion rating themselves as very knowledgeable (11.0%). Only a minority of respondents rate themselves as not at all knowledgeable (12.9%). Statistical analysis showed that there is a statistically significant difference between self-reported knowledge of AI between male and female doctors, with male doctors self-reporting being more knowledgeable ($p<0.001$).

Only a small fraction of the respondents (7.1%) reported having formal training in AI. Among those with formal training, a third (33.3%) stated that their employer provided the AI training.

More than half of the respondents (55.7%) reported having used AI programmes. Among those users, a significant majority (60.7%) specified using AI programmes for work, education or research purposes. Statistical analysis showed that there is a statistically significant difference between reported use of AI programmes between doctors in training and doctors after training, with doctors in training being more likely to have used AI programmes ($p<0.001$), and between reported use of AI programmes with age, with younger doctors being more likely to have used AI programmes than older doctors ($p<0.001$).

The data reveal that respondents use AI for a variety of purposes: figure 1.

The most prevalent uses of AI, among those who indicated that they had used AI for work, education or research purposes (n=70), included writing reflective pieces for portfolios (37.1%), automating administrative tasks (37.1%), writing educational material (34.3%) and searching the scientific literature (31.4%).

A notable proportion of respondents selected 'other' (21.4%) and provided free-text responses: online supplemental material 8. Some notable responses included using AI for accelerating drug discovery, using AI to check for plagiarism in students' work, generating a presentation, image generation, molecule design and aiding in epidemiology studies.

Concerns about AI

This section employed Likert-scaled responses to evaluate concerns among healthcare professionals regarding AI integration in healthcare, as detailed in table 2.

Concerns regarding the legal and ethical implications of AI in healthcare (4a) saw significant agreement, with 44.9% somewhat agreeing and 29.3% strongly agreeing. Similarly, worries about AI influencing funding decisions for patient treatment (4b) saw 33.5% somewhat agreeing and 18.2% strongly agreeing.

Respondents expressed notable concerns about bias in AI applications towards certain patient groups (4c), with 32.8% strongly agreeing and 33.3% somewhat agreeing. Concerns about data security and patient confidentiality (4d) elicited strong responses, with 37.1% strongly agreeing and 28.7% somewhat agreeing.

Prevalent worries emerged about commercial companies using patient data (4e), with 52.0% strongly agreeing and 34.7% somewhat agreeing. Similarly, concerns about AI's impact on priority setting tasks (4f) prompted significant agreement, with 37.4% somewhat agreeing and 16.7% strongly agreeing.

Concerns about potential academic malpractice with AI tools (4g) also drew considerable agreement, with 46.0% somewhat agreeing and 21.8% strongly agreeing. Additionally, concerns about the adequacy of current laws to protect health data (4h) were evident, with 36.5% strongly agreeing and 30.0% somewhat agreeing.

Respondents expressed concerns about AI's impact on the doctor–patient relationship (4i), with 34.2% somewhat agreeing and 21.3% strongly agreeing. Statistical analysis showed that there is a statistically significant difference in relation to self-reported knowledge. Respondents who reported greater knowledge of AI reported less concerns about the impact of AI on the doctor–patient relationship ($p<0.001$).

Similarly, concerns about legal responsibility with AI use for diagnosis or treatment planning (4j) were prevalent, with 43.1% strongly agreeing and 30.4% somewhat agreeing. Opinions regarding AI potentially replacing doctors in some areas (4k) were mixed, with 31.0% somewhat agreeing and 9.4% strongly agreeing. There are statistically significant differences in relation to self-reported knowledge and career stage. Respondents who reported greater knowledge of AI reported less concerns that AI will replace doctors in some areas ($p=0.005$), whereas doctors in training are more concerned than

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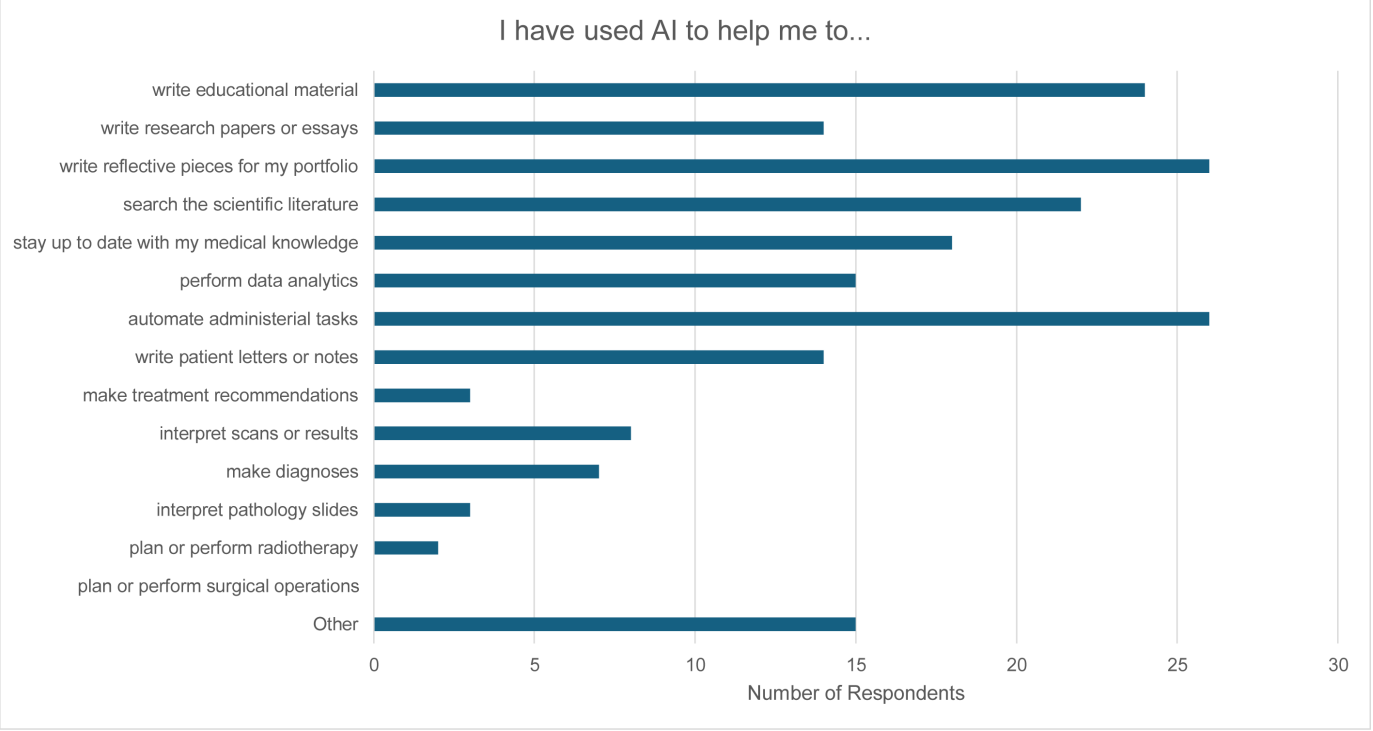

Figure 1 Applications of AI in professional practice as reported by respondents. The bar chart shows the number of respondents who have used AI tools across various tasks in professional practice. The most commonly reported uses include writing educational materials, writing research papers or essays and automating administrative tasks, each with high levels of engagement among respondents. Additional tasks frequently supported by AI include searching scientific literature, performing data analytics and staying updated with medical knowledge. Less commonly reported uses involve interpreting scans or pathology slides, making treatment recommendations, and planning or performing radiotherapy and surgical operations. Responses categorised as 'Other' encompass miscellaneous uses not specified in the predefined categories. AI, artificial intelligence.

those who have completed training that AI will replace doctors in some areas (p=0.004).

The simple summative concern scale had Cronbach's alpha of 0.809, which is acceptable. No statistically significant differences were found relating to this scale.

Requirement for introduction of AI

This section employed Likert-scale responses to examine attitudes towards various aspects of AI integration in healthcare. The findings, as reported in table 2, reveal diverse perspectives on the role and implementation of AI in healthcare.

When considering whether AI should be used to help make ethical or legal patient decisions (5a), respondents were mainly in disagreement, with 32.0% strongly disagreeing and another 32.0% somewhat disagreeing. Opinions on whether AI should always have the ability to explain the decisions it makes (5b) were strongly in agreement, with 54.5% strongly agreeing and 33.2% somewhat agreeing, while only 7.0% disagreed.

Regarding the use of anonymised patient data to train AI models (5c), opinions varied, with 36.9% somewhat agreeing and 14.3% strongly agreeing, while 25.6% disagreed to some degree. Attitudes towards AI making simple autonomous decisions about patients without a doctor's involvement (5d) were largely negative, with 72.3% disagreeing (39.1% strongly disagreeing and 33.2% somewhat disagreeing).

Regarding whether AI should be implemented more quickly in healthcare (5e), respondents exhibited caution, with 53.7% disagreeing (26.1% strongly disagreeing and 27.6% somewhat disagreeing) and only 22.6% agreeing to some degree.

The simple summative requirement scale had Cronbach's alpha of 0.553, which is not acceptable, and was, therefore, not used in statistical analysis.

View on necessary AI regulation

This section used Likert-scale responses to investigate the necessity of various regulatory frameworks and guidelines for the regulation and integration of AI in healthcare. The survey findings, as summarised in table 2, highlight the perceived importance of legal and governmental oversight in this domain.

Respondents overwhelmingly supported the need for a legal regulatory framework for AI in healthcare (6a), with 79.8% strongly agreeing and 18.2% somewhat agreeing. Similarly, there was strong advocacy for government regulation (6b), with 62.9% strongly agreeing and 26.7% somewhat agreeing.

Furthermore, respondents expressed strong support for guidelines from the royal colleges concerning AI in

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Table 2 Survey results on the right to contest AI advice (percentages rounded to the nearest whole number)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree	Total
4. I am concerned…						
4a. about the legal and ethical implications of AI in healthcare.	6 (3%)	17 (8%)	30 (15%)	92 (45%)	60 (29%)	205
4b. about AI being used to help make funding decisions about patients' treatment.	9 (4%)	40 (20%)	49 (24%)	68 (34%)	37 (18%)	203
4c. about bias towards certain patient groups with the use of AI.	2 (1%)	26 (13%)	40 (20%)	67 (33%)	66 (33%)	201
4d. about data security and patient confidentiality in relation to AI.	8 (4%)	33 (16%)	28 (14%)	58 (29%)	75 (37%)	202
4e. about commercial (ie, for profit) companies using patient data.	4 (2%)	12 (6%)	11 (5%)	70 (35%)	105 (52%)	202
4f. about AI performing priority setting task, such as triaging referral letter.	15 (7%)	42 (21%)	36 (18%)	76 (37%)	34 (17%)	203
4g. about academic malpractice in relation to doctors using AI tools.	2 (1%)	22 (11%)	41 (20%)	93 (46%)	44 (22%)	202
4h. that current laws are not enough to protect an individual's health data.	4 (2%)	12 (6%)	52 (26%)	61 (30%)	74 (37%)	203
4i. the impact of AI on the doctor–patient relationship.	6 (3%)	34 (17%)	50 (25%)	69 (34%)	43 (21%)	202
4j. about my legal responsibility if I use AI for diagnosis or treatment planning.	3 (2%)	21 (10%)	30 (15%)	62 (30%)	88 (43%)	204
4k. that AI over time will replace doctors in some areas.	25 (12%)	64 (32%)	32 (16%)	63 (31%)	19 (9%)	203
5. AI should…						
5a. be used to help make ethical or legal patient decisions.	65 (32%)	65 (32%)	39 (19%)	22 (11%)	12 (6%)	203
5b. always have the ability to explain the decision it makes.	8 (4%)	6 (3%)	11 (5%)	67 (33%)	110 (55%)	202
5c. be able to freely use anonymised patient data to train its large AI models.	26 (13%)	26 (13%)	47 (23%)	75 (37%)	29 (14%)	203
5d. be able to make simple autonomous decisions about patients without a doctor.	79 (39%)	67 (33%)	21 (10%)	29 (14%)	6 (3%)	202
5e. be implemented more quickly in healthcare as the benefits outweigh the risk.	53 (26%)	56 (28%)	48 (24%)	37 (18%)	9 (4%)	203
6. There must be…						
6a. a legal regulatory framework for the regulation of AI in healthcare.	1 (0%)	0 (0%)	3 (2%)	37 (18%)	162 (80%)	203
6b. government regulation for the regulation of AI in healthcare.	1 (0%)	4 (2%)	16 (8%)	54 (27%)	127 (63%)	202
6c. guidelines from the royal colleges in relation to AI in their specialties.	0 (0%)	3 (2%)	8 (4%)	37 (18%)	155 (76%)	203
6d. TNICE guidelines and evaluation on AI tools in healthcare.	1 (0%)	3 (2%)	8 (4%)	41 (20%)	150 (74%)	203
6e. a specific (separate) consent process so that patients can consent or decline to the use of AI in their care.	11 (5%)	26 (13%)	44 (22%)	50 (25%)	71 (35%)	202
6f. specific AI training available to all doctors from their employer.	1 (0%)	3 (2%)	14 (7%)	56 (28%)	129 (64%)	203

Number of respondents in each category shown (percentage of respondents shown in brackets).
AI, artificial intelligence.

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Table 3 Survey results on the right to contest AI advice

Question	Description	Frequency	Percentage
7a. Patients must have a right to contest AI advice and seek a second opinion?	Yes	181	89
	No	4	2
	Do not know	19	9
	Total	**204**	**100**
7b. If yes to Q7a. ► This second opinion must be from a human and not from another impartial AI.	Yes	172	96
	No	4	2
	Do not know	4	2
	Total	**180**	**100**

AI, artificial intelligence.

their specialties (6c), with 76.4% strongly agreeing and 18.2% somewhat agreeing. Similarly, there was significant agreement regarding the importance of NICE guidelines and evaluation on AI tools in healthcare (6d), with 73.9% strongly agreeing and 20.2% somewhat agreeing.

Regarding the implementation of a specific consent process for AI use in patient care (6e), respondents demonstrated varying degrees of agreement, with 35.1% strongly agreeing and 24.8% somewhat agreeing. Additionally, there was substantial support for providing specific AI training to all doctors by their employers (6f), with 63.5% strongly agreeing and 27.6% somewhat agreeing.

The simple summative regulation scale had Cronbach's alpha of 0.733, which is acceptable.

Statistical analysis showed that the overall doctors with more self-reported knowledge of AI were generally less in favour of regulation of AI (p=0.004).

Right to contest AI advice

This brief section examined perspectives on patients' rights to contest AI advice and seek second opinions in healthcare settings. The findings, as presented in table 3, shed light on attitudes towards the role of human involvement in decision-making processes involving AI.

The majority of respondents strongly supported patients' right to contest AI advice and seek a second opinion (7a), with 88.7% affirming this stance. Only a small percentage disagreed (2.0%), while 9.3% expressed uncertainty.

Among those who supported patients seeking a second opinion (7b), a significant majority (95.6%) believed that this opinion should come from a human rather than another impartial AI. A minority (2.2%) disagreed with this proposition, and a similar proportion expressed uncertainty (2.2%).

DISCUSSION

Limitations

While this study provides valuable insights into healthcare professionals' perceptions of AI integration in healthcare, several potential limitations should be acknowledged.

The first limitation is in relation to sample size and potential sampling bias. The sample size is adequate, but a larger sample size would have allowed for more in-depth multivariate statistical analysis.

Despite efforts to reach a diverse audience of doctors, certain groups may be over- or under-represented within our sample, leading to sampling bias. For example, recruiting General Practitioners (GPs) was challenging and recruiting foundation doctors was more effective.

The second limitation is in relation to the verification of respondents. Due to the anonymous nature of the survey, it was not possible to verify that respondents were indeed doctors, for example, by verifying their GMC registration number. To address this limitation, the survey was targeted through channels aimed exclusively at doctors, and a confirmation question was included to ensure respondents self-identified as GMC-registered medical doctors. Anonymity was, however, crucial to encourage candid responses, particularly given the potentially controversial nature of AI usage among doctors, such as using AI for tasks like writing portfolio pieces. We could have asked respondents to provide an identifier, for example, their GMC registration number, and promised that this would only be used to check their registration status and then discarded. It is, however, not clear that such a promise would be believed. A similar issue of confidence in a promise of anonymity would have occurred if, for instance, we had used a contact list of GMC-registered medical doctors and had sent each a one-time web link to the survey.

These limitations emphasise the need for caution when interpreting the study findings. Future research should aim for larger and more diverse samples while implementing additional measures to verify respondents' credentials. Exploring the perceptions of GPs regarding AI integration in healthcare could be particularly insightful for future studies, providing a more comprehensive understanding of healthcare professionals' perspectives on this evolving topic.

Use of AI

Our finding that men self-report to be more knowledgeable about AI than women could be due to two reasons, one is that men are more knowledgeable than women about AI and the second is that men are more likely to report higher confidence levels regardless of knowledge levels. There is evidence in other research that even though men and women do not differ in their performance, women in healthcare fields may perceive deficiencies in their abilities more often than their male counterparts.[16 17] The latter seems to be the more likely conclusion with no research evidence showing that

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men are more knowledgeable than women about AI or technology.

55.7% of doctors in our survey reported having used AI, which is roughly in line with a survey of the general public in the UK by the Office of National Statistics which found that 5% of adults reported using AI a lot, 45% a little and 50% not at all.[18]

Our survey demonstrated some questionable uses of AI. Over one-thirds of doctors surveyed who use AI reported that they use it to write reflective pieces for their portfolios. In the UK, writing reflective pieces is a core part of the requirements for doctors in training.[19 20] It is now technically possible for generative AI to write these reflective pieces, and our results show that doctors are using this. This puts into question the usefulness of this practice going forward. Perhaps, it is acceptable if the AI writes the initial reflection, and the doctor acknowledges this and uses it a prop to reflect on what the AI has written. Our findings call for a review of reflective practices of doctors in the UK. A solution could be that of an in-person or online meeting to present reflections, akin to a Schwarz round.[21]

It appears that doctors are using AI in their daily work, but without much or any guidance from their employer. Our findings should encourage employers to provide doctors with training on the use of AI and regulatory bodies, such as the GMC, to consider producing guidance on how they expect doctors to use AI safely.

Concerns about AI

We found that doctors had concerns about the use of AI in healthcare ranging from ethical concerns to commercial companies using data, to potential academic malpractice. Doctors in training were more concerned than doctors who have completed training that AI will replace doctors in some areas. There are several possible explanations. Perhaps senior doctors' experience makes them confident that AI cannot so easily replace the skillset of doctors. Perhaps senior doctors are less worried because they do not think that the replacement will happen while they are still working, or perhaps as a more senior doctor, you practice less 'routinised' medicine that seems more difficult to replace.

Requirement for introduction of AI

There was strong support among doctors for the idea that AI decisions should always be explainable and that AI should not be able to make even simple autonomous decisions about patients. This is in concordance with the general literature on AI ethics where 'explainability' and the need for 'a human in the loop' have been identified as core principles.[8]

View on necessary AI regulation

Our survey demonstrated a strong call for regulation of AI in healthcare from UK doctors. There were strong calls for further regulation from the royal colleges and the GMC. There are current guidelines from the NHS in the form of the 'AI and digital regulations service for health and social care'; however, this does not provide professional guidance for doctors.[22] Smith *et al* called for further professional guidance for doctors in relation to AI use in healthcare.[23] They argue that a doctor's relationship towards AI should be defined by guidance from their regulatory and professional bodies and that these bodies provide little professional guidance.[23] Our survey supports their conclusion.

Our survey also found that doctors who reported being more knowledgeable of AI were generally less in favour of regulation and this is an area for further research.

Right to contest AI advice and the right for a second opinion

We found that doctors agree that patients should have a right to contest AI advice and seek a second opinion. This is in keeping with the new NHS 'Martha's Rule' policy that puts an obligation on NHS hospitals to provide patients rapid access to a second medical opinion.[24] Doctors also agree that this second opinion should come from a human rather than another impartial AI. This contradicts the argument made in the literature that, while the patients should have the right for a second opinion in this context, that right should be a right to a second opinion from an independent AI system.[25]

CONCLUSION

The findings highlight several important issues relating to AI in healthcare. First, doctors are using AI without guidance and some uses are questionable, such as using AI, to write required reflective pieces. Second, there are significant concerns from doctors about the introduction of AI in healthcare ranging from data protection concerns to academic malpractice concerns. Doctors believe that patients have a right to a second medical opinion and that this second medical opinion ought to be from a doctor and not a second impartial AI. Doctors in training are more concerned about AI replacing doctors than senior doctors, suggesting that senior doctors believe that senior decision-making in healthcare is not easily replaced.

Our findings indicate that there is a need for the professional bodies that regulate UK doctors (such as the royal colleges and the GMC) to draft professional guidance for doctors using AI.

When proposing regulation, regulators should aim for clarity on the limits of the use of AI within the profession, for example, in relation to required reflective writing and other educational and training tasks, or, although not studied in this survey, in relation to the evaluation of performance. In relation to the regulation of AI use in healthcare, key considerations must be to (1) ensure the adequate protection of patients' interests and rights, and (2) provide clarity on the role and responsibility of doctors when AI systems are used to provide advice.

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Ethics approval This study involves human participants but the study protocol was classed by the University Research Ethics Committee of the University of Manchester as exempt from formal ethical review. Reference number = 2024-19162-32558. This letter is available in online supplementary material 1. The study protocol was also classed as exempt from an NHS REC review by the NHS Health Research Authority: online supplementary material 2. All subjects gave their informed consent for inclusion before they participated in the study. The study did not collect any personal identifiable information nor track IP addresses of participants. Participants gave informed consent to participate in the study before taking part.

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