



# Neurosurgical note keeping at a regional paediatric neurosurgery centre

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**Introduction:** Medical note keeping is an essential part of all healthcare. It is integral to maintain continuity of care, patient safety, and ensure accurate medical communication. It is important for research, audit, coding and medico-legal purposes. The CRABEL score (2001) was devised to help standardise medical entries by assessing initial admission documentation, subsequent entries, consent and discharge communication. We present a closed loop audit of medical note keeping in a tertiary paediatric neurosurgical centre.

**Methods:** We retrospectively audited the quality of neurosurgical note keeping at Birmingham Children's Hospital. Consent was obtained from the trust clinical audit and registry management service (CARMS). Ten randomly selected case notes were chosen and scored against a modified CRABEL score. The results of the first audit were presented to the surgical directorate management team and a re-audit was conducted to close the loop.

**Results:** The initial audit in 2015 highlighted poor filing of paper notes and records being unavailable at the time of clinical entry. Nursing and allied health care staff had a significantly higher completion rate than then medical staff (98% vs 73%). The re-audit in 2019 showed a notable improvement in overall quality of records by doctors. Completion rate by medical staff went from 73% to 96% and nursing / allied health care staff went from 98% to 95%.

**Conclusion:** Medical note keeping should be continually validated for quality to ensure best patient care. We have shown with regular audit, improvements with medical entries and maintenance of the nursing entries are observed.

**Key words** Clinical documentation • Note keeping • CRABEL • Neurosurgery • Paediatric • Audit

Medical note keeping is a fundamental part of good clinical practice. It forms an essential part of patient documentation, patient care, communication between medical disciplines, medical research, medical coding, medical audit and, increasingly, for complaints and medico-legal purposes (1, 2, 3). However, the quality of medical records is highly variable and multifactorial (4). More com-

monly the most junior team member or physician's assistant is tasked with documenting ward rounds and essential clinical information pertaining to the patient care pathway. It is interesting to note that, commonly, there is a linear relationship between medical experience / seniority and the appreciation for accurate and high quality clinical entries (2, 3). With the importance clinical records have, it is funda-



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## Abbreviations:

CARMS = Clinical Audit and Registry Management Service, EPR = Electronic Patient Records, CNST = Clinical Negligence Scheme for Trusts, AHP = Allied Health Professionals, GMC = General Medical Council, RCP = Royal College of Physicians, WHO = World Health Organisation, NHSLA = NHS Litigation Authority, MDU = Medical Defence Union, MPS = Medical Protection Society, AI = Artificial Intelligence

mental that high standards are implemented and maintained by all clinical staff. Notes should be legible, contemporaneous, unambiguous, signed, dated and timed, with the patient correctly identified on each sheet (4, 5). It is recognised that the most effective ways to sustain excellent note keeping is through regular audit, review of practice and feedback (3, 6).

Crawford, Beresford and Laffety devised the CRABEL score (1) in 2001 to help standardise medical entries by grading the quality of case notes against a set of objective criteria, which itself was derived from the published guidelines by the Royal College of Surgeons of England (1, 2, 7). This system scores case notes out of 50, with points being deducted for missing entries. They advise using 2 case notes per consultant, thereby giving a score out of 100 for that department. This scoring tool has the ability to quickly identify both strengths and weakness within case notes and the quality of medical record keeping (1, 8, 9). The CRABEL score identifies the minimum quality standards expected in patients' notes; hence, a score of 100% is expected for all case notes (9). The CRABEL score does not measure the quality of contents within the medical notes. Despite its simple structure, its uptake has been variable. This is due to each hospital and trust employing their own admission and discharge proformas (10).

The Clinical Negligence Scheme for Trusts (CNST) places grading on individual hospital trusts based on the quality of their medical records. Therefore, there is a practical financial incentive for hospitals to ensure high standards in medical records. Good quality records, supported by regular audits is a cornerstone of CNST level-3 accreditation, which in turn leads to lower financial costs than trusts with only level-2 accreditation (2).

Neurosurgery is an acute specialty, comprising approximately 50% of emergency work, with its service provided at a regional level (11). Neurosurgery delivers senior clinician-driven care, and due to the nature of the pathology, patient clinical status can potentially change rapidly. This highlights the importance for accurate note keeping and communication for all neurosurgical patients.

We present a closed loop audit cycle of medical note keeping from medical and nursing / allied health professionals from a tertiary paediatric neurosurgical centre. This audit aims to examine a universal challenge and identifies mechanisms for improvement in a highly specialised specialty setting.

## **Method**

This initial audit took place in 2015 and the re-audit in 2019. Consent was obtained from all Neurosurgical Consultants and CARMS. Ten case notes were randomly chosen, for each arm of the audit, by hospital number from a list of dis-

charged patients from the Neurosurgical department. All cases studied had a completed admission episode and were discharged after intervention. The CRABEL scoring system was chosen as it was based on the Royal College of Surgeons' guidelines, it was easy to use and reproducible. The original CRABEL score was designed for a 2 person assessment of a single consultant's case notes (1). At Birmingham Children's Neurosurgical department, we function as a team and not as individual firms, with all clinical members working under the supervision of 5 consultants. As we were not auditing individual consultants, but were reviewing the departmental practice, we modified the CRABEL scoring method. The scoring criteria were kept the same, however, we assessed and reviewed each case note by 2 independent doctors. As each case note was being reviewed by 2 independent doctors, it provided a more robust, fair and non-biased assessment of clinical entries. The criteria in which the case notes are assessed were initial assessment (10 points), subsequent entries (30 points), consent (5 points), and discharge letters (5 points). Points were deducted if there were omissions of respective data sets. The overall scores were out of 50 per assessment. Each set of case notes was given a score out of a total of 100. The scoring of notes using the CRABEL criteria is a qualitative assessment. For example, if dates of a medical entry are documented but are not legible, they do not get the respective mark of the CRABEL score.

Nursing and allied health care professionals (AHP) were scored out of a total of 30 points per each assessment. This was due to the absence of an initial assessment, consent or discharge summary. Under the 'results' section we used content entry as a conduit for this. Nursing and AHP were given a score out of total of 60 points.

Each case note was assessed on each parameter of the CRABEL score and logged in a Microsoft Excel database. The scores were averaged between the two assessors across each patient. An average score was calculated for doctors and nursing / AHP entries, respectively. The results were presented as a percentage to allow comparison.

After the initial review and compilation, the results were presented to the surgical directorate, governance and nursing leads in 2019. Recommendations were presented and a timeframe of 2 months was set for dissemination of results and for the subsequent re-audit. After this time point, consent was re-obtained and the audit was repeated in the same manner.

Averages for each section of the CRABEL score was compared as separate data sets for each year for each group. Statistical analysis was conducted using the GraphPad Prism version 8 software (GraphPad Software, San Diego, USA). An independent-samples t-test was performed for each section of the CRABEL score. P-values of <0.05 were considered significant.

## Results

In 2015, nursing staff overall scored better than the medical cohort. The mean CRABEL score for doctors and nursing / AHP were 73% and 98% respectively. In 2019, we noted an improvement in the medical record keeping. The average CRABEL score for doctors and nursing / AHP were 96% and 95% respectively (Fig 1).

In 2015, the regular omissions were those of admission medical documentation. The percentage of mean adequate documentation rate in this section is 73% (Table 1). Referral source, consultant in charge, date/time, clinician signature and entering clinician identifiers (contact number, surname or General Medical Council number (GMC)) were regularly not documented. In the subsequent entries section, the predominant omissions were the clinician identifiers, legibility along with date and time. The mean documentation rate was 76%. Discharge summaries lacked admission and discharge dates as well as follow-up details, with a documentation rate of 76%. Consent forms were completed thoroughly achieving 100% in all sub-categories. These initial results were presented to the surgical directorate managers, clinical governance and nursing leads for Neurosurgery. Recommendations were to incorporate medical recording keeping into the departmental induction for new starters, to demonstrate key pieces of information needed for every case note. Further recommendations were to ensure all case notes were kept accessible for all healthcare staff, medical notes were filed accordingly and kept in chronological order. It was advised that a re-audit would

take place after 2 months.

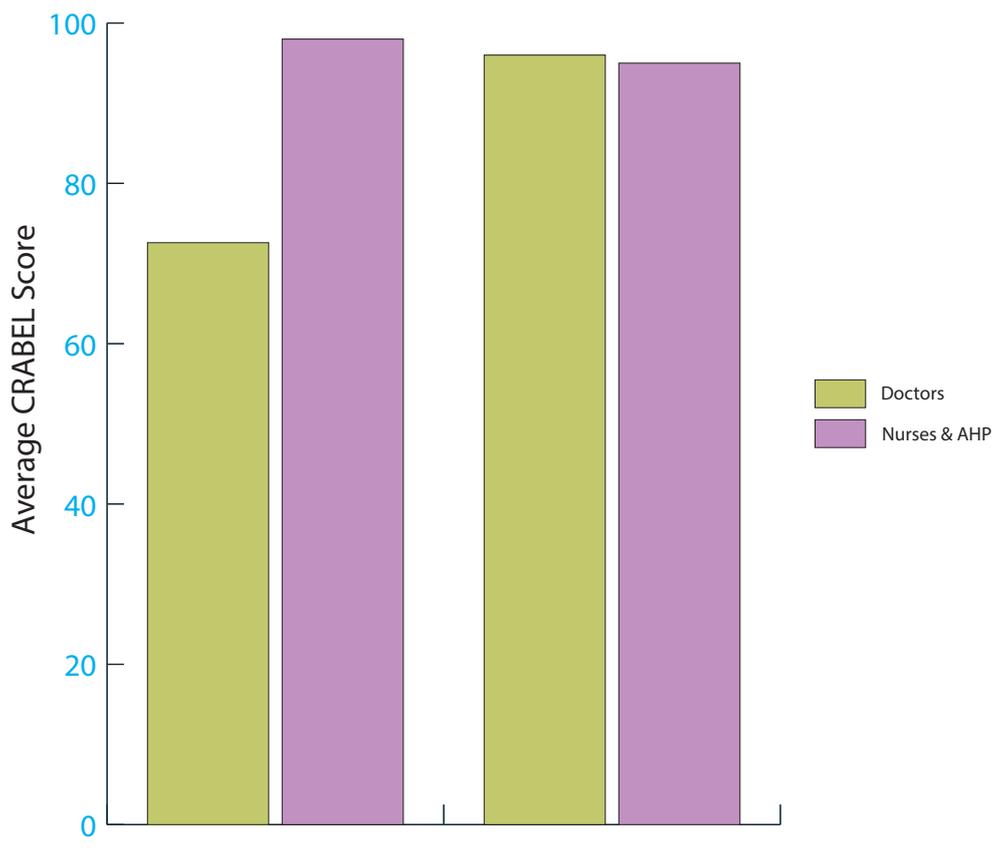
Upon re-review in 2019, there were notable improvements in the initial clerking, including entries of the consultant in charge (from 30% to 80%,  $p=0.0239$ ) and date/time documentation (from 70% to 90%,  $p=0.2878$ ). Although there was an improvement in clinician identifiers, it had only improved to from 20% to 40% completion. Several components noted a deterioration including patient name and demographics, referral course and management plan.

With subsequent entries, we noted an improvement across all sub-categories, including legibility (70% to 86%,  $p=0.0085$ ) and clinician identifiers (page, surname or GMC) (50% to 82%,  $p=0.0042$ ).

Consent continued to achieve 100% completion. In 2019, all discharge summaries scored 100% across each subsection.

Nursing and allied health professionals were generally more accurate and thorough with their entries across both review dates (Table 2). In both reviews, patient identifiers and date/time achieved 100% completion. There was a decline in completion scores noted in results, legibility and signature / name sub-categories (98% to 95,  $p=0.2973$ ).

In the re-audit, after the improvement in the medical documentation, the overall difference between medical and nursing/AHP staff is no longer evident.



**Figure 1.** Average scores obtained for each group across 2015 and 2019 respectively.

	CRABEL Items	2015 Mean Completion rate (%) (n=10)	2019 Mean Completion rate (%) (n=10)	p values
<b>Initial Clerking (10)</b>	Patient Name	100	90	0.33
	Patient Hospital No	100	90	0.33
	Referral Source	60	50	0.67
	Consultant	30	89	0.02*
	Date/Time	70	90	0.29
	Diagnosis	90	90	>0.99
	Management plan	100	90	0.33.
	Investigation results	80	90	0.56.
	Clinical signature	80	90	0.56
	Clinician name/GMC etc.	20	40	0.36.
	Overall	73	80	0.64
	<b>Subsequent Entries (30)</b>	Patient name / hospital number	90	98
Date/Time		82	96	0.02
Heading		84	100	0.005*
Results		80	96	0.01*
Legibility		70	86	0.01*
Signature/bleep/name etc.		50	82	0.004*
Overall		76	93	0.04*
<b>Consent (5)</b>		Patient name	100	100
	Hospital number	100	100	
	Operation in full	100	100	
	Risks/Complications	100	100	
	Signatures	100	100	-
	Overall	100	100	-
	<b>Discharge letters (5)</b>	Patient information	100	100
Admit/discharge date		50	100	0.01*
Diagnosis/management		90	100	0.33
Drugs		100	100	-
Follow-up		100	100	-
Overall		88	100	0.13

**Table 1.** Doctors documentation: Average scores achieved for each sub-section of the CRABEL score in 2015 and 2019 respectively. p-values are determined for each sub-section.

CRABEL Score (subsequent entries (30))	2015 mean completion rate (%)(n=10)	2019 mean completion rate (%)(n=10)	P-value
Patient name / hospital number	100	100	-
Date/time	100	100	-
Heading	98	100	0.33
Results	98	88	0.02*
Legibility	96	90	0.26
Signature/bleep/name etc.	100	94	0.07
Overall	98	95	0.30

**Table 2.** Nursing / AHP documentation: Average scores achieved for each sub-section of the CRABEL score in 2015 and 2019 respectively. P-values are determined for each sub-section.

## Discussion

Accurate medical record keeping is a fundamental part of good clinical practice and an essential part for patient documentation, patient care, patient communication, medical research and audit, and increasingly, for medico-legal purposes especially child protection cases (1, 2, 3).

At the time of the initial review in 2015, Birmingham Children's Hospital utilised a fully paper based system of admission, drug prescription and discharge. We noted the variable quality of documentation in clinical notes across a regional paediatric neurosurgical department. Medical records are the only lasting interpretation of physician-patient interaction (9). The main issues we noted pertained a lack of clinical entries, a lack of a communication log between medical disciplines, poor legibility, lack of patient identifiers, lack of date and time entry, as well as clinician name and contact number.

This prompted a need to quantify the quality of documentation and help determine areas of improvement. After reviewing the documentation from the GMC (5), the Royal College of Physicians (RCP) guidelines (12) for note keeping and the established CRABEL score (1), we commenced an audit to help identify areas of improvement.

We utilised the CRABEL score as it is based on the Royal College of Surgeons of England guidance and can be reproduced without much inter-user variability as it contains ordinal assessment points. With the CRABEL scoring system, any score less than 100% is considered inadequate. It

should be noted that the CRABEL score is not a measure of the quality of the content of medical notes, appropriateness of patient management, or presence/absence of clinical information. It is a useful tool to audit the quality of medical record keeping (1, 8, 9).

The first cycle of the audit clearly demonstrated that nursing and AHP documentation was more complete, legible and contained the necessary date/time stamps and authorship, achieving 96% completion. Medical entries were highly variable achieving 73% completion.

The poor medical record keeping can be explained by several factors identified with hand written medical notes. As with other case note studies, we noted that during ward rounds, clinical case notes were not available at hand and therefore relied on retrospective ward round entries, which would generally be of lesser quality and accuracy (8, 13). Should the notes be available, the speed at which information is relayed between the ward round team is too quick for anyone to scribe accurately, leading to omissions, poor legibility and poor filing of notes. Further issues identified were that patients were not located on one ward for Neurosurgery. Patients were looked after in the Neurosurgical ward, trauma ward, neonatal surgical ward and Paediatric Intensive Care Unit. This geographic variability of patient location resulted in further rushed, poorly legible entries, with omission of key datasets pertinent to the clinical entry, which has been previously reported (8, 13).

We noted poor filing of paper sheets and a culture to place the patient communication sheet into the patient file with-

## Record your work clearly, accurately and, legibly

Documents you make (including clinical records) to formally record your work must be clear, accurate and legible. You should make records at the same time as the events you are recording or as soon as possible afterwards.

You must keep records that contain personal information about patients, colleagues or others securely, and in line with any data protection law requirements.

Clinical records should include:

- relevant clinical findings.
- the decisions made and actions agreed, and who is making the decisions and agreeing the actions.
- the information given to patients.
- any drugs prescribed or other investigation or treatment.
- who is making the record and when.

**Table 3.** Recommendations from the GMC for note keeping. Taken from the GMC – Good Clinical Care (2015) (5).

out filing it properly. This leads to missing and non-contiguous entries. Therefore, although entries may have been made, they were subsequently misplaced or lost, and therefore not part of the documentation trail. It is imperative to avoid loose sheets containing medical information and all documentation should be filed properly and medical notes should be kept in chronological order.

### Consent form completion

Consent form completion had achieved 100% completion in both review periods. This may be explained by several factors. Firstly, being a paediatric neurosurgical unit, consent was more commonly completed by senior residents or Consultants, who know the clinical importance the consent process entails. Also, the completion of consent form forms part of the pre-operative checks and the World Health Organisation (WHO) checklist in theatre, without which any surgery will not proceed. Recently, a lot of emphasis has been placed on consent and consent has been a fundamental part of undergraduate and post graduate teaching programmes (14, 15).

### Medical Note Keeping Standard

The GMC has clearly stated its requirement for accurate medical records under good clinical care (10, 17). The main points are listed in Table 3. It is important to note that both the Health Care Commission inspections and the NHSLA risk management standards include requirements of medical record keeping. Several guidance templates have been issued by medical bodies to help ensure high standards of medical care. The Royal College of Physicians have published guidance on how note keeping can be optimised (Figure 2) (12).

Medical defence unions have also issued guidance on optimising medical records to ensure high standards of care and

mitigate litigation. The Medical Defence Union (MDU) has issued advice and guidance pertaining to good record keeping where they too stress to write legibly, include date/time and avoid abbreviations (16). The Medical Protection Society (MPS) states that if information is missing, found to be inaccurate or indecipherable, it can lead to litigation cases being lost for the trust. In the event of a complaint, clinical negligence claim or disciplinary proceedings, the doctor's defence will in large part depend on the evidence available in the clinical records. They advise that medical records should be clear, objective, contemporaneous, attributable and original (17).

The Academy of Medical Royal Colleges reports the quality of medical records in the UK is highly variable. The layout of the admission, inpatient documentation and discharge proformas differ between hospitals and trusts (10). They have suggested this is due to doctors learning how to take medical history by apprenticeship rather than the application of a standard record structure. However, research evidence shows that the use of structured records have beneficial effect on doctor's performance and patient outcomes (10).

Increasingly patients are requesting to view their medical records for multiple reasons. The medical records should relay the communication of the decisions made, what options were considered and what treatment plan was followed. This is pertinent for medical accuracy especially for litigation reasons (18).

### Nursing / AHP documentation

In our audit, we demonstrated that nursing and AHP documentation standard was better than the medical cohort. This may be due to the reasons aforementioned with ward

Standard	Description
1	The patient's complete medical record should be available at all times during their stay in hospital.
2	Every page in the medical record should include the patient's name, identification number (NHS number) and location in the hospital.
3	The contents of the medical record should have a standardised structure and layout.
4	Documentation within the medical record should reflect the continuum of patient care and should be viewable in chronological order.
5	Data recorded or communicated on admission, handover and discharge should be recorded using a standardised proforma.
6	Every entry in the medical record should be dated, timed (24 hour clock), legible and signed by the person making the entry. The name and designation of the person making the entry should be legibly printed against their signature. Deletions and alterations should be countersigned, dated and timed.
7	Entries to the medical record should be made as soon as possible after the event to be documented (e.g. change in clinical state, ward round, investigation) and before the relevant staff member goes off duty. If there is a delay, the time of the event and the delay should be recorded.
8	Every entry in medical record should identify the most senior healthcare professional present (who is responsible for decision making) at the time the entry is made.
9	On each occasion the consultant responsible for the patient's care changes, the name of the new responsible consultant and the date and time of the agreed transfer of care, should be recorded.
10	An entry should be made in the medical record whenever a patient is seen by a doctor. When there is no entry in the hospital record for more than four (4) days for acute medical care or seven (7) days for long-stay continuing care, the next entry should explain why.
11	The discharge record/discharge summary should be commenced at the time a patient is admitted to hospital.
12	Advanced Decisions to Refuse Treatment, Consent, Cardio-Pulmonary Resuscitation decisions must be clearly recorded in the medical record. In circumstances where the patient is not the decision maker, that person should be identified e.g. Lasting Power of Attorney.

**Fig 2.** Recommendations of note keeping and storage from the RCP. Taken from the Generic medical record keeping standards (2015) Royal College of Physicians (12).

rounds, patients being spread across the hospital and other clinical duties required of the doctors. It is reported that nurses spend up to 25% of their working time on documentation (19). Nursing staff are predominantly ward based and this may result in improved documentation accuracy. AHP (physiotherapists, occupational therapists, speech and language) review patients over several wards but have a structured methodology of documentation and complete

their documentation after the therapy session (20). This timely approach to clinical documentation ensures accuracy and improved patient care. However, this time spent on documentation directly affects the time spent on patient care and mandates a more robust method of documentation that provides clinical accuracy and maintains high levels of patient care (19, 20).

### **The role for Electronic Patient Records (EPR)**

We identified that EPR would carry benefits pertaining to automatic entries of date / time as well as details of the clinician making the entry. Other benefits of EPR are pre-set templates for admission, discharge letter and mandatory data sets such as consultant in charge, date of admission, comorbidities and referral source will need to be filled. In the field of neurosurgery, customised data sets to ensure capture of clinical assessment including Glasgow Coma Score, pupillary assessment and limb neurology can be created. EPR would ensure legibility, allow consent forms to be scanned and uploaded. Electronic discharges would also speed up communication with the GP / practice nurse and ensure accurate follow up details were recorded (21).

Electronic discharge summaries which have been introduced to the hospital since 2017, provide a clear benefit to hand written discharge letters in a number of ways. Upon the second review of case notes in 2019, all the case notes achieved 100% scores in the discharge sub-category as most fields were automatically generated along with mandatory entry of clinical data for the summary to be completed. Further benefits to electronic discharge letters are legibility and the speed at which they can reach the General Practitioner electronically is unrivalled (3). We have mandatory fields to include follow-up plans. Furthermore, dates of admission and discharge are automatically generated. It can also take the operative / comorbidities history and list them for all future admissions. This is vital for accurate coding (3, 21). It has been reported however, that electronic discharges have had their inaccuracies as it may promote a tick box mentality and 'copy and paste' approach to subtext, therefore not ensuring quality (21).

The implementation of a full EPR system that could incorporate medical entries, prescriptions, laboratory investigations, radiology and discharge summaries, would carry a large financial upfront cost to acquire the software, to attain more computers and will require an information technology infrastructure to deal with the severe pressure. There is an issue regarding cyber security and protection of patient information (22). EPR can assist in more than medical record keeping. It can assist in dosing weight dependent prescriptions in paediatric populations and help avoid drug errors (23), storage of medical records for long periods and quick extraction of clinical data without the need to summon hard copies of the case notes. However, it should not replace training, awareness, attitude, habit and maintenance of good documentation for all health care professions.

Combining a robust EPR system with education and training of healthcare professionals, data capture and subsequent analysis would be unrivalled. With such data, artificial intelligence (AI) can play a role to help health care providers provide better patient centred care. AI can detect patterns which are not decipherable using biostatistics by processing massive datasets through layered mathematical models or algorithms. Correcting the algorithm mistakes (training),

only adds to the AI predictive model confidence (24). Harvard Business School (25), reported in 2018, that AI can assist with diagnostic and predictive algorithms, clinical documentation and entry, and provide clinical support. AI is being successfully applied for image analysis in radiology, pathology, and dermatology, with diagnostic speed exceeding, and accuracy paralleling, medical experts (24).

### **Limitations**

It was not established if the medical notes reviewed were elective or emergency cases, as it would be interesting to compare the standard of quality between these groups. Suh et al (2009) noted a clear difference in emergency and elective admission documentation, with emergency admissions containing more omissions of clinical data sets. This was due to increased on call commitments and time constraints (8). It would also be interesting to compare the entries made from both junior and senior doctors. This audit only examined the quality of the entries in the notes. By definition, clinical episodes that were not documented at all would not be assessed. Therefore, this audit may have underestimated the adequacy of the all the clinical episode that should have been documented.

### **Conclusion**

We presented a completed audit cycle in the adequacy of patient case notes documentation by medical and nursing/AHP staff in a regional paediatric neurosurgery unit, using a modified CRABEL score, a simple and reproducible tool. We have shown that with feedback and re-audit we can achieve significant improvements. Overall, medical note keeping improved from 73% to 96% resulting in a better note keeping standard and compliance. Several papers suggest that regular audits are the only way to ensure high and acceptable standards of note keeping. Our paper shows that such results are observed in a regional paediatric neurosurgery unit, a highly specialised setting, as well as a general setting. We believe all medical and health care staff should have formal inductions to medical note keeping ensuring high standards. We have implemented a change to our local induction to incorporate our audit results and have committed to regular audits being conducted to review our note keeping standards. Policies need to be implemented at Trust and departmental level to ensure medical note keeping is as efficient as possible and medical notes are readily available.

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## Comments

In this paper Mr. A. Bhavsar and colleagues report on the effect of a structured audit process on improving performance in medical record keeping. This is an important message in an age where documentation of care has become nearly as important as the care itself. Of course, this paper does not prove that the audit process was responsible for the improvement in physician documentation, as other changes in the process occurred in the time between the first and second audit. Nevertheless, there is truth in the maxim that you cannot improve what you cannot measure.

A note of caution in regard to the discussion about electronic health records (EHR). We were told of all the benefits that would accrue with the use of an EHR when we switched from a paper-based system to an entirely digital system in 2003. Over the last 16 years this has been, at best, a mixed blessing. Adopting EHR technology did not automatically improve the quality of health records, required an enormous capital investment and is cited by our physicians as a significant cause of burn-out.

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The study by Bhavsar et al. sheds light on incomplete note keeping, a common, yet overlooked problem in busy clinical settings, particularly in highly specialized fields such as neurosurgery. They retrospectively selected ten random neurosurgical cases at a regional pediatric center, audited the quality of note keeping, and assigned a score to each case using a modified CRABEL score; a re-audit was then carried out four years later. A significant improvement in the score, reflecting higher completion rate of note keeping based on CRABEL, was noted among doctors after four years (73% to 96%).

Although the sample is relatively small and statistical significance was not achieved among all CRABEL subcategories, the 23% improvement in completion rate among doctors highlights the significance of continuous auditing and feedback on note keeping. A standardized medical entry form including essential components of every type of note (admission, progress, discharge, etc.), as well as training on how to obtain the information required for these notes, should be implemented; Electronic Medical records, in fact, facilitated the process and ensured completion of note keeping.

I would like to congratulate the authors on conducting this study and would like to see future studies on this topic at a larger scale and spanning various specialties.

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Good note keeping is fundamental to good clinical practice. Physician documentation in the medical record is essential for communicating the clinical status and care plan to other healthcare providers. The medical record also serves as a medicolegal document to protect the physician should medical malpractice be alleged. This article also shows the utility of regular audit for medical notes in Hospital units.

In the current paper the authors audited the quality of neurosurgical note (medical and nursing /allied health care staff) in a regional pediatric neurosurgery unit Hospital in UK in two different periods in 2015 and 2019. Ten case notes were randomly chosen by hospital number from a list of discharged patients from the Neurosurgical department. The CRABEL (Crawford, BEresford, Lafferty) score was used by the authors. They found some interesting points as nursing and allied health care staff had a significantly higher completion rate than then medical staff (98% vs 72.6%) in 2015, and after a re-audit took place in 2019 they observed an improvement in overall quality of records by doctors. Completion rate by medical staff went from 72.6% to 96% and nursing / allied health care staff went from 98% to 95%.

I think that electronic patient records and more recently Artificial intelligence (AI) research within medicine are growing rapidly. However, the medical notes will be more efficient with the new technology combined with continued education for health professionals.

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Accurate medical note keeping is an essential part of every healthcare system. Its clinical, medico-legal, ethical and epidemiological importance can't really be overestimated. Bhavsar et al. presented a completed audit cycle on the adequacy of patient case notes documentation by medical and

nursing/Allied Health Professionals staff in a regional UK paediatric neurosurgical unit, using a simple and reproducible score system. They showed that with feedback and re-audit it is possible to achieve significant improvements resulting in a better note keeping standard and compliance. The recent introduction of Electronic Patient Records (EPR) in many Hospitals will carry benefits to the system in the long run, but requires constant training, and it has been seen as a hindrance rather than help, especially by the most senior clinicians.

A more promising option is to use Artificial Intelligence (AI) to make existing EPR systems more flexible and intel-

ligent. Some delivery networks, sometimes in collaboration with their EPR platform vendor, are making strides in this direction. AI capabilities for EPRs are currently relatively narrow but we can expect them to rapidly improve. In the meantime, as shown by the authors in this nice article, regular audits are still the best way to ensure high and acceptable standards of note keeping.

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