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An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital

Lebohang Matau Nkadimeng

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg in partial fulfilment of the requirements for the degree of Master of Medicine in the branch of Anaesthesiology.

Johannesburg, 2021

Declaration

I, Lebohang Matau Nkadimeng declare that this research report is my own unaided work. It is being submitted for the Degree of Master of Medicine in the branch of Anaesthesiology at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



6 May 2022

Abstract

Background

The anaesthetic chart is an important component of a patient's health record in the perioperative period. Studies have shown that anaesthetic charts are often incomplete. The adequacy of chart completion in the anaesthetic department at Chris Hani Baragwanath Academic Hospital (CHBAH) has never been quantified. An audit was done, and the charts were assessed for adequacy of completion.

Methods

A retrospective audit of anaesthetic charts was done for the year 2019. Using a peer reviewed checklist adapted from the Australian and New Zealand College of Anaesthetists (ANZCA) and the South African Society of Anaesthesiologists (SASA) guidelines, a sample of 333 charts was audited to assess adequacy of completion. To eliminate sampling bias, a stratified sampling method was used.

Results

Completeness was defined as a chart scoring 100%. None of the charts scored 100%. The overall median score of the charts was 77%. Charts were subdivided into three groups. Charts scoring between 75-99% (n=212), 50-74% (n=121) and charts less than 50% complete (n=0). Patient category (adult versus paediatrics), time of shift (day versus night) and type of anaesthetic were audited and compared as factors that could affect chart completeness. The only factor that had a statistically significant difference in chart completeness was the patient category, where adult chart completion scored higher compared to paediatric charts with a p-value <0.0074.

Conclusion

In conclusion the charts audited scored higher than previous audits done both locally and internationally. Some important aspects of the charts were poorly documented. Ongoing audits and training on chart completion can potentially improve the adequacy of completion and should be part of the academic program.

Better documentation has the potential to improve perioperative patient care and mitigate medicolegal risks.

Acknowledgements

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Lastly, I would like to thank the anaesthesia secretary Ms Phindile Twala for giving me access to the records room with neatly arranged anaesthetic charts.

Thank you!

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Abbreviations

AAGBI	Association of Anaesthetists of Great Britain and Ireland
AIMS	Anaesthesia Information Management System
ANZCA	Australian and New Zealand College of Anaesthetists
ASA	American Society of Anesthesiologists
CAS	Canadian Anesthesiologists' Society
CHBAH	Chris Hani Baragwanath Academic Hospital
HPCSA	Health Professions Council of South Africa
SASA	South African Society of Anaesthesiologists

Statement

The Research Report consists of a literature review, author guidelines, draft article, study proposal and appendices. The study proposal is included for background reference and is not for examination.

The formatting of the Research Report complies with the University of the Witwatersrand's Style Guide for Theses, Dissertations and Research Reports. The draft article complies with the author guidelines of the Southern African Journal of Anaesthesia and Analgesia, the journal to which submission is intended and may differ from the University of the Witwatersrand's Style Guide for Theses, Dissertations and Research Reports to comply with the author's style guide.

Section 1: Review of the literature

1.1 Introduction

The anaesthetic chart is an important component of a patient's health record in the perioperative period (1). The primary purpose of the anaesthetic chart is documenting the clinical management, physiological parameters and the overall care of patients presenting for an anaesthetic. It plays a vital role in guiding the future anaesthetic management of patients especially when an anaesthetic related adverse event has occurred (2). Secondary functions of the chart include its usage for quality assurance, coding, departmental administration and increasingly in the medicolegal setting (2, 3). The anaesthetic chart is often the only documentation that the anaesthesiologist has of the perioperative events. It should be a comprehensive and concise reflection of the preoperative assessment, intraoperative anaesthetic events as well as postoperative monitoring of physiological parameters. The adequacy of completion of the anaesthetic chart is often used as a surrogate marker of the quality of the overall anaesthetic care. Inadequate documentation of perioperative events can be seen as an indication that an event, or management of an event did not occur (1, 3, 4). The first line of defence in a medicolegal lawsuit is documentation where the "not documented, not done" principle applies (4-7). More and more patients are bringing lawsuits against clinicians in situations where they feel they have been harmed. A comprehensive anaesthetic chart is very useful to refute a claim of negligence or decrease the settlement amount if negligence is proven. The same benefit of comprehensive anaesthetic charts applies to enquiries from the Health Professions Council of South Africa (HPCSA) and criminal lawsuits.

1.2 History of anaesthetic charts

Anaesthetic documentation has not always been perceived as an important part of patient care. The ether chart, which was the earliest form of documentation of intraoperative events during an anaesthetic, was developed by Harvard medical students Harvey Cushing and Ernest Codman in 1895 (8, 9). The reason for its development remains controversial, although Cushing writes that he was instructed to do so by the chief of surgery (8). In the late 1800s in the United

States, the task of giving patient a “whiff” of chloroform or ether during surgical procedures was often left to the most junior staff members whether it be nurses, medical students or even individuals with no medical training. Intraoperative anaesthetic related deaths were not uncommon in the 1890s and for the sake of academic gain, the surgery would often continue even after patient had demised. Cushing was greatly affected when a patient demised under his anaesthetic care. This prompted him to develop an anaesthetic record that reflects the physiological changes that occur in a patient under anaesthesia. Initially the only variable charted was the patient’s heart rate. Cushing met the inventor of the sphygmomanometer in 1902 and blood pressure measurement was subsequently added to the anaesthetic record (8). Since then, meticulous record keeping, and comprehensive documentation have become part of standard anaesthetic practice.

1.3 Guidelines for adequate anaesthetic chart documentation

Various societies of anaesthesiologists have published guidelines with recommendations on chart completion and record keeping. These societies include the Association of Anaesthetists of Great Britain and Ireland (AAGBI) (10), Australian and New Zealand College of Anaesthesiologists (ANZCA) (2), Canadian Anesthesiologists Society (CAS) (11), American Society of Anesthesiologists (ASA) (12) and the South African Societies of Anaesthesiologists (SASA) (13).

ANZCA published a detailed booklet with guidelines and recommendations on the completion of anaesthetic charts. The most recent update of these guidelines is from 2020. Their recommendations for an adequately completed anaesthetic chart include charting basic patient and procedural information, pre-anaesthetic consultation, intraoperative anaesthesia information with monitoring, blood loss, complications, and post anaesthesia information (2).

SASA practice guidelines dedicated only a small portion of the document to perioperative documentation and chart adequacy (13). These guidelines were adapted from the Canadian Anaesthesiologists’ Society (CAS) guidelines that were published in 2010 (11). The Canadian guidelines clearly stipulate the

physiological variables should be monitored and documented in the intraoperative and postoperative period. The guideline also highlight that the physiological variables should be documented every five minutes in stable patients and even more often in unstable patients. If there is any deviation from the guidelines, the anaesthetist is obliged to document the deviation on the anaesthetic chart with reasons (11).

The Health Professions Council of South Africa (HPCSA) has guidelines on the keeping of patient records and what compulsory information should be included in a patient record (14). The HPCSA booklet 9 gives medicolegal guidance on signing of official records, alteration of records and duration for the retention of health records (14).

1.4 Studies on anaesthetic chart audits

The value of charting physiological variables and intraoperative events during an anaesthetic is known but there seems to be an alarming trend, both locally and internationally, of inadequate completion of anaesthetic charts (15-19).

In a randomised audit of anaesthetic charts in a local hospital in Cape Town South Africa, 284 pre-printed manually completed charts were collected over a period of one week and analysed using a five-point questionnaire designed by the researchers to assess chart completeness. Findings of the audit showed only 29% of the charts were adequately completed and legible. The study focused on the potential medicolegal consequences of inadequate chart completion. It also highlighted that chart completion did not meet the standards recommended by the different societies of anaesthesiologists (15). Gebremedhn et al conducted a similar audit in a low resource setting in Ethiopia and their audit also revealed substandard chart documentation with variables such as blood loss and consent were documented in less than 30% of their charts (19).

Inadequate chart completion is not just a problem seen in low resource countries. International studies have shown poor compliance to the recommendations from the published guidelines even in high income countries (16, 17). Elhalwani et al

assessed the adequacy of perioperative documentation of anaesthetic charts in an Australian hospital using the ANZCA guidelines. Their sample size was larger compared to the two studies done in Africa (15, 19). They audited 850 charts covering a longer period. The audit, however, had similar results with only 27% of the charts being adequately completed (17).

1.5 Manual handwritten chart design

Anaesthetic charts may either be manually completed or generated through an automated process. The current handwritten anaesthesia record is very similar to the ether record produced more than a century ago. Very little literature exists on how the anaesthetic chart should be designed. This is true for both handwritten charts and those generated automatically. However, there is consensus that the format of a well-designed chart should assist the user in adequately documenting pertinent information (9, 20).

The chart should facilitate the documentation of clinically relevant information through all three phases of perioperative management (9). A study done by Marco et al showed that a user friendly, logical design promoted adequate chart documentation. The design of the anaesthesia chart should group items logically and separate sections should be distinct (9, 20). The format that most anaesthesic charts follow is either structured or an unstructured data entry. The structured format allows the user to select relevant options from various pre-printed lists. The unstructured format is a free text entry system although the category may be prompted.

The structured format has many advantages and should be used wherever possible. When used in a handwritten record it is more legible and relies less heavily on the clinician’s recollection of required items. It prompts the user to select options of the required items and is associated with a higher degree of completeness when compared to the unstructured format (20). The main drawback of the structured format when used in handwritten records is the increased use of document space. Another disadvantage of the structured format is that some events are not easily communicated in the very rigid design. The ideal

anaesthesic chart thus should be a balance of structured and unstructured formats (20).

Manual handwritten charts can be time consuming and prone to subjectivity, illegibility, incompleteness, and data entry bias (16, 21). Rowe et al showed that up to 30% of intraoperative events may be subject to omission or bias entry in the handwritten charts (21). There has been an apparent trend towards avoidance of charting extreme physiological values and opting for a smoother physiological trend that is then a distortion of the true physiological state of the patient. Anaesthetists may think that the extreme variable is an artifact, or too brief to be of physiological consequence. They may also omit to document an extreme value when such falls outside of their fixed time interval. There is a widespread assumption, however, that failure to record true physiological variables frequently represents the anaesthetists defensive attitude towards outside scrutiny (21).

Vigoda et al reported about anaesthesiologists having inappropriate and pre-attested documentation on their charts, mostly done at the beginning of the procedure (22). A claim against one of the anaesthesiologists at the University of Miami alleging inappropriate documentation on an anaesthetic chart created doubt about whether their anaesthesiologists were present throughout prolonged and complex procedures (22).

McDonald et al reported that up to 11% of the anaesthesiologists' intraoperative time is dedicated to manual completion of handwritten charts (23). Many anaesthesiologists believed that manual charting could be risky, as this involved simultaneous patient care and real time charting of the intraoperative events (22). The anaesthesiologists completed the chart at a time that was most convenient to them. This may have medicolegal implications because real time charting is ideal as it avoids omission of important events and enhances overall chart documentation (24).

1.6 Anaesthesia Information Management Systems (AIMS)

Automated computer-generated anaesthetic charts could reduce times devoted to chart completion while increasing the quality of data recorded (22, 25).

The automated management information systems are specialised forms of electronic health record (EHR) systems. They allow the automatic and reliable collection, storage, and presentation of data during the perioperative period (25, 26). They automatically record vital signs and allow the anaesthetist to enter other events such as drug administration and perioperative events. These events are captured on a timeline. In addition to providing basic record-keeping functions, they typically also provide end users with access to summarised data. These summaries can be used to facilitate quality assurance and research functions as well as provide a record of a patients' previous anaesthetic. They have been found to enhance detection of adverse events under anaesthesia thus adding an invaluable tool to quality improvement (25, 26). While the core functionality of AIMS focuses on the automatic and reliable capture of intraoperative patient data, most AIMS today also include modules for storing pre- and postoperative patient information (26).

Comparisons between the two different modes of documentation have yielded differing results. Edwards et al compared manual handwritten anaesthetic charts to those generated by an anaesthesia management information system (AIMS) to assess chart completeness between the two modes of documentation. In this study the charts generated by AIMS were more complete than the manual handwritten charts with a mean difference of 7.1%. Chart documentation earlier on in the study was more detailed in both modes of documentation but declined over time (25).

The introduction of AIMS in various institutions has been shown to be beneficial, however, AIMS has generated a few controversies as having the potential to be a medicolegal liability (22, 25, 27).

A previous case report showed that AIMS failed to recognise incoming data and thus may have posed a medicolegal liability (22, 25). Wrightson et al showed that having AIMS in place does not necessarily improve documentation (27). Some have argued that AIMS has increased the medicolegal implications, where brief physiological changes under anaesthesia may be exploited by a plaintiff's attorney in a malpractice case but this has remained controversial (28).

1.7 Altering physician behaviour

Altering physician behaviour is not easy, even with clear guidelines in place and with them knowing that poor documentation has medicolegal implications. It has been shown that didactic lectures have been the least effective in reinforcing the importance of adequate charting. Known and ongoing audits seem to somewhat aid in altering physician behaviour (16, 29).

In the past there was an implicit expectation that when physicians became aware of new information regarding clinical practice, they would automatically change their practice patterns (30). This has not been the case because altering physician behaviour is complex and can be difficult.

Greco and Eisenberg looked at different ways in which physicians could be encouraged to change their practices when new information in the medical fraternity was published (31). It was shown that changing physician behaviour was more complex than what was initially thought. A passive approach in the form of education through guidelines and lectures was shown to be the least effective. The reason for this was because many physicians preferred a tried and familiar way of practice regardless of what new research and guidelines may recommend. Some institutions have offered incentives to anaesthetists for adequate chart completion. This reward systems has ultimately improved quality of chart documentation (22).

Ongoing sequential audits have been shown to improve perioperative chart documentation. Curtis et al conducted three consecutive prospective audits three years apart at a tertiary care centre in South Australia (16). This was part of a departmental quality assurance programme. The sequential audits showed an improvement in documentation over the years when staff became aware that regular audits of anaesthetic documentation were underway. A total of 43.8% of perioperative records were appropriately documented in 2014 as opposed to 16.3% in 2009 when the audit initially began (16). Interventions involving more than one strategy such as both education and feedback were proven to be more effective (32).

1.8 Summary

The anaesthetic chart is the sole documentation of patient care during the perioperative period. Both local and international audits have revealed poor compliance in chart completion, even with guidelines set in place (15-17, 19). Inadequate documentation not only compromises patient care but poses a huge medicolegal liability. The anaesthetic department at Chris Hani Baragwanath Academic Hospital forms part of the training circuit of the University of the Witwatersrand. The academic programme mainly focuses on the different patient profiles that may be encountered and how to tailor an anaesthetic for each patient. Even though the anaesthetic chart is a vital component of patient perioperative care, there are no formal lectures on chart documentation. An audit will be conducted using a peer reviewed checklist adapted from the SASA and ANZCA guidelines. With the problem quantified, hopefully there will be better chart documentation and thus overall improvement in perioperative care.

1.9 References

(1) Mathioudakis A, Rousalova I, Gagnat A*, et al.* How to keep good clinical records. *Breathe (Sheff)*. 2016; 12(4):369-73. DOI: 10.1183/20734735.018016.

(2) Australian and New Zealand College of Anaesthetists. 2020. Guideline on the anaesthesia record. Available: https://www.anzca.edu.au/getattachment/7a980821-2346-4659-80ab-b85c209d8254/PS06-Guideline-on-the-anaesthesia-record-(PILOT) [Accessed on 03.06.2021].

(3) Parakh S. Legal Aspects of Anaesthesia Practice. *Indian J Anaesth*. 2008; 52(3):247-57. https://www.ijaweb.org/text.asp?2008/52/3/247/60631.

(4) Gibbs R. The present and future medicolegal importance of record keeping in anesthesia and intensive care: the case for automation. *J Clin Monit*. 1989; 5(4):251-55. DOI: 10.1007/BF01618257.

(5) Woldegerima Y, Kemal S. Clinical audit on the practice of documentation at preanesthetc evaluation in a specialized university hospital. *Anesth Essays Res*. 2018; 12(4):819-24. DOI: 10.4103/aer.AER_131_18.

(6) Raymer K. The Anesthetic Record: How Content and Design Influence Function In Anesthetic Practice and Beyond. *J Anesthe Clinic Res*. 2011; 4(282). DOI: 10.4172/2155-6148.1000282.

(7) Roach V, Lau T, Ngan Kee W*, et al.* Perioperative documentation: are we doing enough? *Aust N Z J Obstet Gynaecol*. 1998; 38(2):166-9. DOI: 10.1111/j.1479-828x.1998.tb02993.x.

(8) Sundararaman LV, Desai SP. The Anesthesia Records of Harvey Cushing and Ernest Codman. *Anesth Analg*. 2018; 126(1):322-29. DOI: 10.1213/ane.0000000000002576.

(9) Fisher JA, Bromberg IL, Eisen LB. On the design of anaesthesia record forms. *Can J Anaesth*. 1994; 41:973-83. DOI: 10.1007/BF03010941.

(10) Association of Anaesthetists of Great Britain and Ireland. Recommednations for standards of monitoring during anaesthesia and recovery 2015. *Anaesthesia*. 2016; 71:85-93. DOI: 10.1111/anae.13316/full.

(11) Merry A, Cooper J, Soyannwo O*, et al.* International Standards for a Safe Practice of Anesthesia 2010. *Can J Anaesth*. 2010; 57(11):1027–34. DOI: 10.1007/s12630-010-9381-6.

(12) American Society of Anaesthesiologists. 2018. Statement on Documentation for Anaesthesia Care. Available: https://www.asahq.org/standards-and-guidelines/statement-on-documentation-of-anesthesia-care [Accessed on 23/01/2020].

(13) South African Society of Anaesthesiologists. 2018. South African Society of Anaesthesiologists. Practice Guidelines 2018 Revision. Available: https://sasaapi.sasaweb.com/Newsletters/Document/SASAPracticeGuidelines2018_637577175424650913.pdf [Accessed on 21.11.2019].

(14) Health Professions Council of South Africa. 2016. Guidelines For Good Practice In The Health Care Professions. Guidelines On The Keeping Of Patient Records. Booklet 9. Available: http://www.hpcsa.co.za [Accessed on 12.10.2019].

(15) Raff M. An audit of anaesthetic record keeping. *South Afr J Anaesth Analg*. 2003; 9(3):7-9. DOI: 10.1080/22201173.2003.10873005.

(16) Curtis WB, Sethi R, Visvanathan T*, et al.* Peri-Operative Anaesthetic Documentation: A Report of Three Sequential Audits on the Quality of Outcomes, with an Insight Into Surrounding Legal Issues. *Turk J Anaesthesiol Reanim*. 2018; 46(5):354-61. DOI: 10.5152/tjar.2018.40222.

(17) Elhalawani I, Jenkins S, Newman N. Perioperative anesthetic documentation: Adherence to current Australian guidelines. *J Anaesthesiol Clin Pharmacol*. 2013; 29(2):211-5. DOI: 10.4103/0970-9185.111726.

(18) Devitt J, Rapanos T, Kurrek M*, et al.* The anesthetic record: accuracy and completeness. *Can J Anaesth*. 1999; 46(2):122-28. DOI: 10.1007/BF03012545.

(19) Gebremedhn E, Nagaratnam V. Audit on Anaesthetic Record Completeness at A University Teaching Hospital Operation Theater of Low-Resource Setting, 2013. *J Anesth Crit Care*. 2017; 8(2). DOI: 10.15406/jaccoa.2017.08.00298.

(20) Marco A, Buchman D, Lancz C. Influence of form structure on the anesthesia preoperartive evaluation. *J Clin Anesth*. 2003; 15(6):411-41. DOI: 10.1016/S0952-8180(03)00079-5.

(21) Rowe L, Galletly D, Henderson L. Accuracy of text entries within a manually compiled anaesthetic record *Br J Anaesth*. 1992; 68(4):381-87. DOI: 10.1093/bja/68.4.381.

(22) Vigoda MM, Lubarsky DA. The medicolegal importance of enhancing timeliness of documentation when using an anesthesia information system and the response to automated feedback in an academic practice. *Anesth Analg*. 2006; 103(1):131-6, table of contents. DOI: 10.1213/01.ane.0000221602.90315.49.

(23) McDonald J, Dzwonczyk R, Gupta B*, et al.* A second time-study of the anaesthetist's intraoperative period. *Br J Anaesth*. 1990; 64(5):582-85. DOI: 10.1093/bja/64.5.582.

(24) Tollinche L, Shi R, Hannum M*, et al.* The impact of real-time clinical alerts on the compliance of anesthesia documentation: A retrospective

observational study. *Comput Methods Programs Biomed*. 2020; 191:1-7. DOI: 10.1016/j.cmpb.2020.105399.

(25) Edwards K, Hagen S, Hannam J*, et al.* A randomized comparison between records made with an anesthesia information management system and by hand, and evaluation of the Hawthorne effect. *Can J Anaesth*. 2013; 60(10):990-7. DOI: 10.1007/s12630-013-0003-y.

(26) Ehrenfeld J, Rehman M. ANESTHESIA INFORMATION MANAGEMENT SYSTEMS: A REVIEW OF FUNCTIONALITY AND INSTALLATION CONSIDERATIONS. *J Clin Monit Comput*. 2011; 25(1):71-79. DOI: 10.1007/s10877-010-9256-y.

(27) Wrightson W. A Comparison of Electronic and Handwritten Anaesthetic Records for Completeness of Information. *J Anesth Crit Care*. 2010; 38(6):1052-58. DOI: 10.1177/0310057X1003800615.

(28) Feldman J. Do Anesthesia Information Systems Increase Malpractice Exposure? Results of a Survey. *Anesth Analg*. 2004; 99(3):840-43. DOI: 10.1213/01.ANE.0000130259.52838.3B.

(29) Olateju S, Adenekan A, Owojuyigbe A. The effect of teaching on the completeness of the anaesthesia record charts for obstetric subarachnoid blocks in a low resource hospital. *J Obstet Anaesth Crit Care*. 2015; 5(1):16-21. DOI: 10.4103,2249-4472.155194.

(30) Cohen MM, Rose DK, Yee DA. Changing anesthesiologists' practice patterns. Can it be done? *Anesthesiology*. 1996; 85(2):260-9. DOI: 10.1097/00000542-199608000-00006.

(31) Zarnegar R, Brown M, Henley M*, et al.* Patient perceptions and recall of consent for regional anaesthesia compared with consent for surgery. *J R Soc Med*. 2015; 108(11):451-56. DOI: 10.1177/0141076815604494.

(32) Greco PJ, Eisenberg JM. Changing physicians' practices. *N Engl J Med*. 1993; 329(17):1271-3. DOI: 10.1056/nejm199310213291714.

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Submitted manuscripts that are not in the correct format and without the required supporting documentation specified in these guidelines will be returned to the author(s) for correction and will delay publication.

AUTHORSHIP

Named authors must consent to publication **by signing a covering letter** which should be submitted as a supplementary file. Authorship should be based on substantial contribution to:

(i) conception, design, analysis and interpretation of data;

(ii) drafting or critical revision for important intellectual content; and

(iii) approval of the version to be published. These conditions must all be met (uniform requirements for manuscripts submitted to biomedical journals; refer to **www.icmje.org**); and

(iv) exact contribution of each author must be stated.

DECLARATION OF CONFLICT OF INTEREST

Authors must declare all sources of support for the research and any association with a product or subject that may constitute a conflict of interest. If there is no conflict of interest to declare please include the following statement: The authors declare no conflict of interest.

FUNDING SOURCE

All sources of funding should be declared. Also define the involvement of study sponsors in the study design, collection, analysis, and interpretation of data; the writing of the manuscript; the decision to submit the manuscript for publication. If the study sponsors had no such involvement, this should be stated as follows: No funding source to be declared.

RESEARCH ETHICS COMMITTEE APPROVAL

The submitting author must provide written confirmation of Research Ethics Committee approval for all studies including case reports. The ethics committee as well as the approval number should be included.

STATISTICAL ANALYSIS

Authors are advised to involve medical statisticians at the protocol stage of their research project: to plan sample size, and the selection of appropriate statistical tests for analysis and presentation.

PROTECTION OF PATIENT'S RIGHTS TO PRIVACY

Identifying information should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives informed written consent for publication. The patient should be shown the manuscript to be published. Refer to **www.icmje.org**.

ETHNIC CLASSIFICATION

The rationale for analysis based on racio-ethnic-cultural categorisation should be indicated.

CATEGORIES OF SUBMISSIONS

Shorter items are more likely to be accepted for publication, owing to space constraints and reader preferences.

Original articles

Original articles on research relevant to anaesthesia and analgesia should not exceed 3 200 words, no more than 30 references, with up to 6 tables or figures. A structured abstract under the following headings, Background, Methods, Results, and Conclusions is a requirement and should not exceed 300 words.

Clinical Review articles

Review articles relevant to anaesthesia and analgesia should not exceed 2 400 words, with a maximum of 20 references and no more than 6 tables or figures. A summary of 300 words or less is required.

Case reports

Case reports should not exceed 1 800 words with no more than 10 references. Figures are limited to 2 figures and may include images or photographs. The case report should have three headings: Summary (not exceeding 100 words), Case report (with no introduction) and Discussion. Case reports will be published online only. The summary and the URL will appear in the printed version.

Scientific Letters

Scientific Letters should not exceed 2 400 words with a maximum of 10 references. Only one table or illustration is permissible. A structured abstract under the following headings, Background, Methods, Results, and Conclusions, is a requirement and should not exceed 250 words.

Letters to the editor

Letters to the editor should be 800 words or less with only one image or table.

MANUSCRIPT PREPARATION

Refer to articles in recent issues for the presentation of headings and subheadings. If in doubt, refer to 'uniform requirements' - **www.icmje.org**. Manuscripts must be provided in **UK English**.

Qualification, affiliation and contact details

This information must be provided for ALL authors and must be submitted as a supplementary file.

Email addresses of all author must be provided.

ORCID number of **ALL** authors must be provided – if authors do not have ORCID, please register at https://orcid.org/

Abbreviations

All abbreviations should be spelt out when first used and thereafter used consistently, e.g. 'intravenous (IV)' or 'Department of Health (DoH)'.

Scientific measurements

Scientific measurements must be expressed in SI units except blood pressure (mmHg) and haemoglobin (g/dl). Litres is denoted with a lowercase 'l' e.g. 'ml' for millilitres). Units should be preceded by a space (except for %), e.g. '40 kg' and '20 cm' but '50%'. Greater/smaller than signs (> and 40 years of age) should also be preceded by a space e.g. > 20 years. No spaces should precede ± and °, i.e. '35±6' and '19°C'.

Numbers should be written as grouped per thousand-units, i.e. 4 000, 22 160...

Quotes should be placed in single quotation marks: i.e. The respondent stated: '...' Round **brackets** (parentheses) should be used, as opposed to square brackets, which are reserved for denoting concentrations or insertions in direct quotes.

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Journal references:

1. Jun BC, Song SW, Park CS, Lee DH. The analysis of maxillary sinus aeration according to aging process: volume assessment by 3-dimensional reconstruction by high-resolutional CT scanning. Otolaryngol Head Neck Surg. 2005 Mar;132(3):429-34.
2. Polgreen PM, Diekema DJ, Vandeberg J, Wiblin RT, et al. Risk factors for groin wound infection after femoral artery catheterization: a case-control study. Infect Control Hosp Epidemiol [Internet]. 2006 Jan [cited 2007 Jan 5];27(1):34-7. Available from: http://www.journals.uchicago.edu/ICHE/journal/issues/v27n1/2004069/2004069.web.pdf.

Book references: Jeffcoate N. Principles of Gynaecology. 4th ed. London: Butterworth, 1975:96-101. *Chapter/section in a book:* Weinstein L, Swartz MN. Pathogenic Properties of Invading Microorganisms. In: Sodeman WA jun, Sodeman WA, eds. Pathologic Physiology: Mechanisms of Disease. Philadelphia: WB Saunders, 1974:457-472.

Internet references: World Health Organization. The World Health Report 2002 - Reducing Risks, Promoting Healthy Life. Geneva: World Health Organization, 2002. http://www.who.int/whr/2002 (accessed 16 January 2010).

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Section 3: Draft article

An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital

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Key words: anaesthesia, audit, anaesthetic charts

Abstract

Background

The anaesthetic chart is an important component of a patient's health record in the perioperative period. Studies have shown that anaesthetic charts are often incomplete. The adequacy of chart completion in the anaesthetic department at Chris Hani Baragwanath Academic Hospital (CHBAH) has never been quantified. An audit was done, and the charts were assessed for adequacy of completion**.**

Methods

A retrospective audit of anaesthetic charts was done for the year 2019. Using a peer reviewed checklist adapted from the Australian and New Zealand College of Anaesthetists (ANZCA) and the South African Society of Anaesthesiologists (SASA) guidelines, a sample of 333 charts was audited to assess adequacy of completion. To eliminate sampling bias, a stratified sampling method was used**.**

Results

Completeness was defined as a chart scoring 100%. None of the charts scored 100%. The overall median score of the charts was 77%. Charts were subdivided into three groups. Charts scoring between 75-99% (n=212), 50-74% (n=121) and charts less than 50% complete (n=0). Patient category (adult versus paediatrics), time of shift (day versus night) and type of anaesthetic were audited and compared as factors that could affect chart completeness. The only factor that had a statistically significant difference in chart completeness was the patient category, where adult chart completion scored higher compared to paediatric charts with a p-value <0.0074.

Conclusion

In conclusion the charts audited scored higher than previous audits done both locally and internationally. Some important aspects of the charts were poorly documented. Ongoing audits and training on chart completion can potentially improve the adequacy of completion and should be part of the academic programme. Better documentation has the potential to improve perioperative patient care and mitigate medicolegal risks.

Introduction

The anaesthetic chart is an important component of a patient's health record in the perioperative period. The primary purpose of the chart is to document the clinical management of patients presenting for an anaesthetic. It also plays a vital role in guiding the future management of subsequent anaesthetics a patient may receive. Secondary functions of the chart include its usage for quality assurance, coding, departmental administration, and increasingly in the medicolegal setting. [1-3] Often it is the sole documentation that the anaesthesiologist has of the perioperative events. It, therefore, should be a comprehensive and concise reflection of the preoperative assessment, intraoperative anaesthetic events as well as postoperative monitoring. It has been said that the first line of defence in a medicolegal lawsuit is documentation. [2, 4, 5]

The ether chart, which was the earliest form of documentation of intraoperative events, was developed by Harvard medical students Harvey Cushing and Ernest Codman in 1895. [6] It was the first document which showed physiological changes during the administration of an anaesthetic. Initially the variable charted was the patient's heart rate while blood pressure was later added in 1902. [6] Since then, record keeping and documentation in anaesthesia has evolved to encompass a more detailed account of perioperative events.

Societies of anaesthesiologists worldwide have published guidelines with recommendations on chart completion and record keeping. These societies include the Association of Anaesthetists of Great Britain and Ireland (AAGBI), Australian and New Zealand College of Anaesthesiologists (ANZCA) [1], Canadian Anesthesiologists' Society (CAS) [7], American Society of Anesthesiologists (ASA) [8] and the South African Societies of Anaesthesiologists (SASA). [9]

Audits done both locally and internationally have revealed inadequate documentation on the anaesthetic charts even with guidelines for chart completion published. [3, 10-12] Manual handwritten completion of charts was one of the factors thought to contribute to inadequate documentation, since up to 11% of time in theatre can be dedicated to chart completion. [13] This led to the introduction of the Anaesthesia Information Management System (AIMS) in developed countries. AIMS has been beneficial because it has decreased the amount of time spent on chart documentation while improving the quality of chart adequacy. [7, 14] In certain instances some have argued that AIMS has increased the medicolegal implications,

where a brief physiological change under anaesthesia may be exploited by a plaintiff's attorney in a malpractice case. [15] AIMS, however, remains beneficial.

Chart documentation remains under medicolegal scrutiny. Meticulous documentation is medicolegal proof of perioperative events and avoids the pitfall of 'not documented; not done'. [16, 17] It can be postulated that something not performed, will not be documented. Internal audits of charts can identify gaps in anaesthetic practice and use these as teaching opportunities.

The adequacy of completion of the anaesthetic charts at CHBAH has not been quantified. An audit of the charts was performed using a checklist derived from the SASA and ANZCA guidelines to assess chart adequacy.

Methods

This was a descriptive retrospective study.

Ethical approval was sought and obtained from the Human Research Ethics committee of the University of the Witwatersrand and the post graduate committee. Approval to conduct the study was sought and granted from the Anaesthesia Head of Department and the Medical Advisory Committee at CHBAH. The study was conducted in accordance with the declaration of Helsinki [18] and the South African Good Clinical Practice Guidelines. [19] The study also adhered to the Protection of Personal Information Act (POPIA) where no patient or medical professional information was published or disclosed as part of the study. [20]

A sample size of 336 charts was determined in consultation with a biostatistician and was based on the proportion of complete charts in previous literature averaging 30%. On average, 2700 anaesthetic cases are done monthly therefore, the minimum sample size for a power of 80% and a precision of 3% is 112 charts per strata. Therefore, the total number of charts selected over a three-month period was 336. This specific sample was calculated with Epi info version 6.

All patients that had an anaesthetic administered had an anaesthetic chart filled out. It is hospital policy to have the anaesthetic chart signed by the receiving nurse in the recovery area or the receiving doctor in high dependency units. Charts from all theatres at CHBAH were included in the study. Charts documenting sedation as the sole anaesthetic technique were excluded. In an attempt to eliminate sampling bias, a probability sampling method

was used, specifically stratified random sampling. The year was divided into three different strata and a sample of charts was taken from each stratum. The strata were based on the registrar and intern rotations into which the academic year was divided. Data was collected during three different months of the year 2019. The months were January, May, and August 2019. These months were part of three different registrar rotations to target three different groups of registrars and interns. The months were chosen on the basis that they all had 31 days, one public holiday and four weekends thus the number of cases performed during those months should be similar. Within each month, systematic sampling methods were used where a chart was selected at a specific interval, in this case every 18th chart was audited. Auditing every 18th chart allowed for a wide spread of charts during the month sampled to be audited. When this interval was repeated within a month, chart sampling fell on every day of the week.

Adequacy of chart completion was defined as the chart meeting 100% of the checklist requirements. Since it was unlikely that the charts would meet this criterion, the charts were grouped into three categories: those scoring 75-99%; 50-74% and scoring less than 50%. The charts were audited using a 53-point checklist adapted from the ANZCA and SASA guidelines. The data collection sheet used in this study was peer reviewed by three senior specialists in the anaesthetic department. Their experienced input deemed the minimum requirements the chart should contain in the context of this study.

Data was captured using a Microsoft Excel® spreadsheet. A descriptive analysis was performed using frequency and proportion tables, and bar graphs to describe the categorical variables. Continuous variables were summarised using means and standard deviations or medians and interquartile ranges where appropriate based on the distribution of the data. Comparisons between groups were performed using tests of proportions in the form of the independent Student T test and P-values less than 0.05 were considered statistically significant.

Results

A total of 336 charts were audited for the year 2019. Three charts were excluded as they documented procedures performed under sedation. The charts were scored out of a total of 53 when the patient received a general anaesthetic or a combination of both a general and regional anaesthetic. In cases where only a regional anaesthetic was performed, the charts

were scored out of a total of 47. This is because six variables were not applicable in the setting of a regional technique namely breathing system, size of the endotracheal tube or laryngeal mask airway, ventilation settings, ventilation technique, end tidal CO_2 and end tidal agent. Each individual documented variable was scored if it was present (see Tables 1,2,3).

Table 1: Percentage scores of individual variables (Demographics and preoperative assessment)

Demographics	**Percentage complete (%)**
Name	100
Hospital number	99.7
Date	100
Age/Date of birth	99.7
Gender	100
Surgeon/proceduralist	83.78
Anaesthetist	100
Weight	88.56
Height	0
Procedure	99.10
Preoperative assessment	**Percentage complete (%)**
Baseline observations	18.32
Patient comorbidities	91.59
Concurrent medications	53.45
ASA status	95.80
Previous anaesthetic	76.88
Allergies	71.17
Fasting status	44.14
Examination	99.40
Airway assessment	71.77
Relevant investigations	69.97
Premedication	18.92
Consent indicated	34.83

Table 2: Percentage scores of individual variables (intraoperative charting)

Intraoperative charting	Percentage complete (%)
Time of shift	100
Anaesthetic technique	100
Sequence of events	100
Fluid therapy	97.30
Intravenous access	99.10
Airway maintenance	92.79
Airway size *	94.49
Breathing system *	89.76
Ventilation settings *	79.92
Ventilation technique *	40.55
Duration of anaesthetic	89.79
Duration of procedure	33.63
Drugs administered	99.40
Drug dosages	99.40
Time drug administered	100
Patient position	23.72
Monitoring	100
Monitoring interval (every 5 minutes)	36.04
Blood pressure	100
Pulse	100
Mean arterial pressure	99.40
Saturation	99.70
End tidal CO2 *	95.28
End tidal anaesthetic agent*	89.98
Temperature	39.04
Blood loss	20.12
Urine output	8.71
Complications	50.15

***Not applicable in cases where regional anaesthesia was administered.

Table 3: Percentage scores of individual variables (postoperative monitoring)

Postoperative monitoring	Percentage complete (%)
Vitals (cardiovascular system)	95.20
Respiration	92.49
Neurological status	91.89

The overall median score for chart adequacy was 77% with an interquartile range (IQR) of (72-81). Based on the overall scores, the charts were grouped into three categories: those scoring 75-99%, 50-74% and less than 50%. None of the audited charts scored 100% and none of the charts scored < 50%. Of the 333 charts, 212 (63.6%) scored between 75-99% and 121 (36.4%) charts scored in the 50-74% category (see Figure 1).

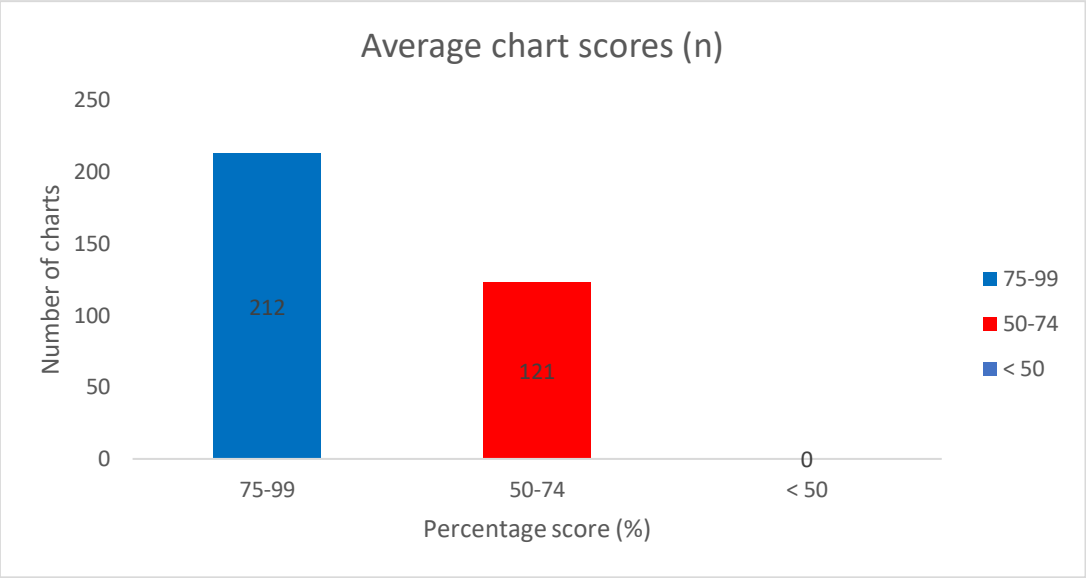


Figure 1: Average chart scores

The data collection sheet was subdivided into four sections: demographics, preoperative assessment, intraoperative events, and postoperative monitoring. For normality, the Shapiro-Wilk test was used. The percentage scores for all sections were not normally distributed hence we used the median and inter-quartile range (IQR) to describe the data by section. In each section, the maximum and minimum scores were determined, and the overall median of each section analysed (see Table 4).

Table 4: Average chart scores as per different sections

Section	Percentage complete (%) **Median (IQR)**	Percentage complete (%) **Minimum**	Percentage complete (%) **Maximum**
Demographics	90 (80 – 90)	60	90
Pre-operative assessment	67 (50 – 75)	8	100
Intra-operative charting	79 (73 – 82)	54	96
Post-operative events	100 (100 – 100)	0	100
Overall	**77 (72 – 81)**	**51**	**91**

Patient category, time of shift and type of anaesthetic were audited, and factors considered that could potentially affect chart completeness. These factors were analysed to see if there was a statistically significant difference in the chart scores. The normality of percentage scores for subgroups was tested using the Shapiro Wilk test and it was found that the scores were normally distributed. The mean, standard deviation (SD) and t-test were therefore used to compare the percentage scores for adequacy of completeness between the different categories (see Table 5).

Table 5: Comparative scores of three different variables

Variable	Category (n=number of charts audited)	Percentage complete (%) Mean ± SD	t-test p-value
Patient category	Adult (n=240)	77.40 ± 6.39	0.0074*
	Paediatric (n=93)	75.20 ± 7.30	
Shift	Day (n=179)	76.74 ± 6.80	0.91
	Night (n=154)	76.83 ± 6.64	
Type of Anaesthetic	General (n=251)	76.70 ± 6.84	0.71
	Regional (n=82)	77.02 ± 6.36	

*P value < 0.05 significant at 5% level

Discussion

The anaesthetic chart is an important document detailing perioperative events of a patient presenting for an anaesthetic. It is imperative that it is adequately completed, not only due to the potential medicolegal implications but also as a reflection of the quality of patient care. [2, 3, 11]

The main finding in this study, was that the charts audited at CHBAH scored significantly higher compared to previous audits done both locally and internationally, with a median chart completion score of 77%. Sequential audits done in South Australia by Curtis et al had chart completion ranging from 25.5% to 35.1% over a five-year period. [11] Studies done by Raff, in Cape Town South Africa, and Elhalwani et al, in Australia, reported median chart completion scores of 29% and 32% respectively. [3, 10]

The highest scoring variables were patient name, gender, anaesthetist, anaesthetic technique, sequence of events, time of drug administration and patient monitoring. These variables were recorded in 100% of the charts audited. This finding is in keeping with other audits done where patient demographics were documented in more than 90% of the charts. [3, 21, 22] Zemedkun et al had slightly different results where they had very poor documentation of patient information with more than 90% of the charts not having complete patient names. [23]

The lowest scoring variables were height (0%), urine output (8.7%) baseline observations (18.3%), blood loss (20.2%), patient position (23.7%) and patient consent (34.8%). These findings were similar to the study done by Zemedkun et al where BMI was recorded in 1.2% of their charts and preinduction vitals were recorded in 37.5% of their charts. [23] In our study the low documentation of urine output could be attributed to the fact that not all patients presenting for an anaesthetic had a urinary catheter sited.

Marco et al and Raymer et al reported that chart design influences the adequacy of chart completion, where a user-friendly logical design promotes chart adequacy. [24, 25] In this study, the chart design is a combination of both the structured and unstructured format. The structured format allows the user to select relevant lists of items or options already pre-printed. The unstructured format is a free text entry system although the category maybe prompted. [24] Our results demonstrated that the chart variables that had a structured format were more likely to be complete. Patient demographics and postoperative monitoring, which had a structured format, had higher median scores of 90% and 100% respectively. The preoperative and intraoperative events which have an unstructured format, scored 67% and 79% respectively.

Other factors that were considered to potentially play a role and affect chart completion were audited and compared. Fatigue associated with extended working hours was one of the factors. [26, 27] In a study where anaesthesia residents had to perform simulation after a night shift, it was shown that increased sleepiness decreased nontechnical skills, with documentation being one of those skills. [26] However, in this study the findings were different. There was no statistically significant difference in chart adequacy between day and night shifts, p-value 0.91. A possible reason for the difference could be that night shift in this study is over a 16-hour period compared to the other studies referenced where the extended hour shifts were at least over a 25-hour period. [26, 27]

Of the 333 charts audited, 251 (75.4%) were documenting a general anaesthetic and the remaining 82 (24.6%) charts were documenting a regional anaesthetic. There was no statistically significant difference in documentation, with a p-value of 0.71. This finding was similar to the study published by Elhalwani et al. [3] This evidence suggests that the type of anaesthetic administered does not affect chart adequacy of completion.

A comparison of chart documentation was made between paediatric and adult cases. An assumption was made that due to the meticulous anaesthetic associated with paediatric cases, chart documentation would be expected to be superior. In this study, adult cases had statistically significant better chart documentation compared to paediatric cases (p-value <0.0074).

Limitations

The study was done at a single institution using a standardised anaesthetic chart template. The results of the study cannot be extrapolated to other institutions or to different anaesthetic chart templates.

A further limitation is that the study has assigned the same weight to all the variables studied while some variables may in fact be less important than others and in some instances be irrelevant in the care of the patient. An example would be the height variable in a paediatric population where drug doses are weight based in patients <18 years and < 40kg.[28] Omission of height from a chart for paediatric anaesthesia is thus not of the same importance as omission of some other variables.

Conclusion

In conclusion, the anaesthetic charts audited at CHBAH scored higher when compared to previous audits done both locally and internationally with a median score of 77%. Even with a higher overall completion score, variables such as height, baseline observations, premedication, patient position, blood loss and urine output were documented in less than a third of the charts.

The type of anaesthetic and time of shift did not affect the adequacy of chart completion. Adequacy of completion of adult charts was higher compared to the paediatric population which was statistically significant with a p-value of p <0.0074. Ongoing lectures and audits are necessary in the department to improve chart documentation. This should improve

patient perioperative care and decrease the risk of successful medicolegal claims against the anaesthetist.

Conflict of interest

The authors declare that they have no financial or personal relationships, which may have inappropriately influenced them in writing this paper.

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References

(1) Australian and New Zealand College of Anaesthetists. 2020. Guideline on the anaesthesia record. Available: https://www.anzca.edu.au/getattachment/7a980821-2346-4659-80ab-b85c209d8254/PS06-Guideline-on-the-anaesthesia-record-(PILOT) [Accessed on 03.06.2021].

(2) Gebremedhn E, Nagaratnam V. Audit on Anaesthetic Record Completeness at A University Teaching Hospital Operation Theater of Low-Resource Setting, 2013. *J Anesth Crit Care.* 2017; 8(2). DOI: 10.15406/jaccoa.2017.08.00298.

(3) Elhalawani I, Jenkins S, Newman N. Perioperative anesthetic documentation: Adherence to current Australian guidelines. *J Anaesthesiol Clin Pharmacol*. 2013; 29(2):211-5. DOI: 10.4103/0970-9185.111726.

(4) Parakh S. Legal Aspects of Anaesthesia Practice. *Indian J Anaesth.* 2008; 52(3):247-57. https://www.ijaweb.org/text.asp?2008/52/3/247/60631.

(5) Mathioudakis A, Rousalova I, Gagnat A, Saad N, *et al*. How to keep good clinical records. *Breathe (Sheff)*. 2016; 12(4):369-73. DOI: 10.1183/20734735.018016.

(6) Sundararaman LV, Desai SP. The Anesthesia Records of Harvey Cushing and Ernest Codman. *Anesth Analg*. 2018; 126(1):322-29. DOI: 10.1213/ane.0000000000002576.

(7) Edwards K, Hagen S, Hannam J, Kruger C, *et al.* A randomized comparison between records made with an anesthesia information management system and by hand, and evaluation of the Hawthorne effect. *Can J Anaesth.* 2013; 60(10):990-7. DOI: 10.1007/s12630-013-0003-y.

(8) American Society of Anaesthesiologists. 2018. Statement on Documentation for Anaesthesia Care. Available: https://www.asahq.org/standards-and-guidelines/statement-on-documentation-of-anesthesia-care [Accessed on 23/01/2020].

(9) South African Society of Anaesthesiologists. 2018. South African Society of Anaesthesiologists. Practice Guidelines 2018 Revision. Available: https://sasaapi.sasaweb.com/Newsletters/Document/SASAPracticeGuidelines2018_637577175424650913.pdf [Accessed on 21.11.2019].

(10) Raff M. An audit of anaesthetic record keeping. *South Afr J Anaesth Analg*. 2003; 9(3):7-9. DOI: 10.1080/22201173.2003.10873005.

(11) Curtis WB, Sethi R, Visvanathan T, Sethi S. Peri-Operative Anaesthetic Documentation: A Report of Three Sequential Audits on the Quality of Outcomes, with an Insight Into Surrounding Legal Issues. *Turk J Anaesthesiol Reanim.* 2018; 46(5):354-61. DOI: 10.5152/tjar.2018.40222.

(12) Roach V, Lau T, Ngan Kee W, Wormald P. Perioperative documentation: are we doing enough? *Aust N Z J Obstet Gynaecol*. 1998; 38(2):166-9. DOI: 10.1111/j.1479-828x.1998.tb02993.x.

(13) McDonald J, Dzwonczyk R, Gupta B, Dahl M. A second time-study of the anaesthetist's intraoperative period. *Br J Anaesth.* 1990; 64(5):582-85. DOI: 10.1093/bja/64.5.582.

(14) van Schalkwyk J, Lowes D, Frampton C, Merry A. Does manual anaesthetic record capture remove clinically important data? *Br J Anaesth*. 2011; 107(4):546-52. DOI: 10.1093/bja/aer163.

(15) Feldman J. Do Anesthesia Information Systems Increase Malpractice Exposure? Results of a Survey. *Anesth Analg*. 2004; 99(3):840-43. DOI: 10.1213/01.ANE.0000130259.52838.3B.

(16) De Roubaix JM. Seeking patients' consent in anaesthesiology: consent in clinical practice. *South Afr J Anaesth Analg*. 2005; 11(4):125-29. DOI: 10.10520/EJC73489.

(17) Medical Protection Society. 2017. Problematic anaesthetic. Available: https://www.medicalprotection.org/southafrica/case-reports/specialty/anaesthetics/anaesthetics-case-reports/problematic-anaesthetic [Accessed on 8/08/2021].

(18) World Medical Association. 2001. World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Available: https://apps.who.int/iris/handle/10665/268312 [Accessed on 2/02/2019].

(19) Department of Health. 2006. Department of Health Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa. Available: http://www.kznhealth.gov.za/research/guideline2.pdf [Accessed on 4/01/2020].

(20) Government Gazette. 2013. Protection of Personal Information Act, Act No. 4. Available: https://www.gov.za/sites/default/files/gcis_document/201409/3706726-11act4of2013protectionofpersonalinforcorrect.pdf [Accessed on 21/02/2020].

(21) Falcon D, Francois C, Jacquot C, Payen J. Evaluating the quality of anesthetic records. *Ann Fr Anesth Reanim*. 1999; 18(3):360-67. DOI: 10.1016/s0750-7658(99)80063-x.

(22) Desalu I, Olanipekun O, Agbamu P. An Audit of Anaesthesia Record-keeping at the Lagos University Teaching Hospital. *Afr J Anaesth Int C*. 2010; 10:1-5. DOI: 10.4314/ajaic.v10i1.60591.

(23) Zemedkun A, Mulugeta H, Getachew H, Destaw B, *et al.* Assessment of Manual Intraoperative Anesthesia Record-Keeping Practice at Dilla University Referral Hospital, Dilla, Ethiopia. *Open Access Surg*. 2021; 14:1-7. DOI: 10.2147/OAS.S298387.

(24) Marco A, Buchman D, Lancz C. Influence of form structure on the anesthesia preoperartive evaluation. *J Clin Anesth*. 2003; 15(6):411-41. DOI: 10.1016/S0952-8180(03)00079-5.

(25) Raymer K. The Anesthetic Record: How Content and Design Influence Function In Anesthetic Practice and Beyond. *J Anesthe Clinic Res*. 2011; 4(282). DOI: 10.4172/2155-6148.1000282.

(26) Neuschwander A, Job A, Younes A, Mignon A, *et al.* Impact of sleep deprivation on anaesthesia residents' non-technical skills: a pilot simulation-based prospective randomized trial. *Br J Anaesth*. 2017; 119(1):125-31. DOI: org/10.1093/bja/aex155.

(27) Howard S, Gaba D, Smith B, Weigner M, *et al.* Simulation Study of Rested versus Sleep-deprived Anesthesiologists. *Anesthesiology*. 2003; 98(6):1345-55. DOI: 10.1097/00000542-200306000-00008.

(28) Matson K, Horton E, Capino A. Medication Dosage in Overweight and Obese Children. *J Pediatr Pharmacol Ther*. 2017; 22(1):81-83. DOI: 10.5863/1551-6776-22.1.81.

Section 4: Proposal

An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital

Lebohang Nkadimeng

300884

Supervisor	Lizili Gilliland Department of Anaesthesiology
Co-supervisor	Dorinka Nel Department of Anaesthesiology
Co-supervisor	Mduduzi Mashinini Department of Anaesthesiology

4.1 Introduction and problem statement

The anaesthetic chart is an especially important component of a patient's health record in the perioperative period. The primary purpose of the chart is documenting the clinical management and the overall care of patients presenting for an anaesthetic. It plays a vital role in guiding the future management of subsequent anaesthetics that a patient could potentially receive. Secondary functions of the chart include its usage for quality assurance, coding, departmental administration and increasingly in the medicolegal setting (1). Very often it is the sole documentation that the anaesthesiologist has of the perioperative events thus it should be a comprehensive and concise reflection of the preoperative assessment, intraoperative anaesthetic events as well as postoperative anaesthetic orders.

Documentation has not always been perceived as an important part of patient care. The ether chart developed by Codman and Cushing in 1895 was the earliest form of documentation of intraoperative events during the administration of an anaesthetic (2). Intraoperative anaesthetic related deaths were not uncommon in the 1890s but when Cushing had a patient demise under anaesthesia, he was greatly affected, and this led to the development of an anaesthetic record showing physiological changes under anaesthesia. Initially the variable charted was the patient's heart rate and later blood pressure was measured and included in the chart as early as 1902 (2). Since then, record keeping and documentation in anaesthesia has evolved to encompass more.

Although the value of charting physiological variables and intraoperative events during an anaesthetic is known, there seems to be an alarming trend both locally and internationally of inadequate completion of anaesthetic charts (3, 4). Societies for anaesthesiologists in different parts of the world have developed various guidelines in an attempt to standardise what is deemed acceptable documentation for chart completeness. The Australian and New Zealand College of Anaesthesiologists (ANZCA) formed in 1992 published guidelines on the recommendation of the completion of anaesthetic charts, most recently updated in

2019 (1). Other societies include the Canadian, American and South African Societies of Anaesthesiologists (SASA) who have also published similar guidelines over the years (5, 6). Even with guidelines set in place, chart audits in various institutions reveal extremely poor compliance.

In a randomised audit of anaesthetic charts in an institution in Cape Town South Africa, 284 preprinted manually completed charts were collected over a period of one week and analysed using a 5-point questionnaire designed by the researchers to assess chart completeness. Findings of the audit showed only 29% of the charts were adequately completed and legible. The study results focused on the potential medicolegal consequences that inadequate chart completion may give rise to and the fact that the chart completion did not meet the standards recommended by the different societies of anaesthesiologists (4).

Inadequate chart completion is not just a problem seen in middle- and low-income countries. International studies have also shown that auditing of anaesthetic charts reveals very poor compliance and completeness as recommended by published guidelines (7). The adequacy of perioperative documentation in anaesthetic charts was assessed in a hospital in Australia using their ANZCA guidelines (1) with a larger sample size of 850 charts over a longer time period yielding very similar results with only 27% of the charts being adequately completed (7).

Ongoing sequential audits have been shown to improve perioperative chart documentation. Curtis conducted three consecutive prospective audits on the quality of perioperative anaesthetic charts, using the 2009 ANZCA guidelines as a standard, as part of a departmental quality assurance program at a tertiary care centre in South Australia in the years 2009, 2011 and 2014, respectively. The sequential audits showed an improvement in documentation over the years when staff became aware that regular audits of anaesthetic documentation were underway. A total of 43.8% of perioperative records were appropriately documented in 2014 as opposed to 16.3% in 2009 when the audit initially began (3).

Various interventions have been trialed over the years to try standardise and improve anaesthetic charting. Many anaesthesiologists believed manual charting

could be the source of the problem; as this involved simultaneous patient care and real time charting of the intraoperative events (8). A total of 15% of anaesthesiologists' intraoperative time is dedicated to manual handwritten charting. Computer automation of this task could reduce times devoted to charting while increasing the quality of data recorded (8).

Edwards compared manual handwritten records to those made by an anaesthesia management information system (AIMS) to assess chart completeness between the two modes of documentation. In this study the AIMS records were more complete than the manual handwritten records with a mean difference of 7,1%. Chart documentation earlier on in the study was more detailed in both modes of documentation but declined over time (9). Even with AIMS in place at various institutions, certain problems have arisen with inadequate or even inaccurate charting.

There have been various studies on reports of anaesthesiologists having inappropriate and pre-attested documentation on their charts, mostly done at the beginning of the procedure. A claim against one of the anaesthesiologists at the University of Miami alleging inappropriate documentation on a chart, gave rise to questions with regards to the presence and supervision of the anaesthesiologists during complex procedures requiring a prolonged anaesthetic (8). Even with the AIMS in place it was found that during emergence when there was a great deal of pressure on the anaesthesiologist, there was no time to adequately document the sequence of events and there was a very high likelihood of forgetting. Like many busy professionals, the anaesthesiologists charted retrospectively and in some instances events yet to happen at a time that was most convenient which in fact poses many medicolegal implications (8).

A complete anaesthetic record must be able to tell a story of the perioperative events surrounding patient care. Apart from the fact that an anaesthetic chart can be used as a liability against the anaesthesiologist in a medicolegal setting, it is meant to be used as a tool to assess quality of patient care. SASA published guidelines on perioperative documentation which were adapted from the guidelines previously published by the Canadian Anaesthesiologists' Society (CAS).

These guidelines clearly stipulate the various physiological variables that should be documented in the intraoperative and postoperative period and how frequently they should be documented. If there's any deviation from the guidelines, it should be documented on the anaesthetic chart with reason (5).

ANZCA published a more detailed booklet on charting guidelines, last updated in 2019 (1). These guidelines have recommendations of what should be documented on the anaesthetic chart. The recommendations include charting basic patient and procedural information, pre-anaesthetic consultation, intraoperative anaesthesia information with monitoring, blood loss and complications and lastly post anaesthesia information (1). The Health Professions Council of South Africa (HPCSA) has also published guidelines on the keeping of patient records and what compulsory information should be included in a patient record (10). Also included in the HPCSA booklet is information on signing of official records, alteration of records and duration for the retention of health records (10). Good medical records can be the strongest malpractice defense in medicolegal malpractice cases (11).

Considering all the published literature, the manner of documentation is an important part in overall patient care but there is still alarming trend of poor charting. Even with guidelines in place, altering physician behaviour is not easy. It has been shown that didactic lectures have been least effective in reinforcing the importance of adequate charting. Known and ongoing audits seem to somewhat aid in altering physician behaviour (3, 12). The marked variations in the quality of charting have led to concerns about the differences in the quality of patient care.

In the past there was an implicit expectation that when physicians became aware of new information regarding clinical practice, they would automatically change their practice patterns (13). Greco looked at different ways in which physicians could be encouraged to change their practices when new information in the medical fraternity was published (14). It was shown that changing physician behaviour was more complex than what was initially thought. A passive approach in the form of education through guidelines and lectures was shown to be the most ineffective. The reason for this was because many physicians preferred a tried and familiar way of practice irrespective of what new research and guidelines may

recommend. Interventions involving more than one strategy such as both education and feedback were proven to be more effective (14).

The adequacy of chart completion at Chris Hani Baragwanath Hospital (CHBAH) is unknown. In this study, preprinted manually completed anaesthetic charts CHBAH theatre complexes will be audited for adequacy using a checklist adapted from the SASA and ANZCA guidelines. Factors that may be contributing to poor chart completion will also be explored.

Chris Hani Baragwanath Academic Hospital (CHBAH) is a tertiary hospital and training institution for medical professionals of differing levels, ranging from principal specialists to medical students, that the University of the Witwatersrand is affiliated with.

The department of anaesthesia at CHBAH forms part of the training departments that the hospital offers. It has a large number of theatres catering to different surgical disciplines both on and off site. Due to the vast nature of operating theatres, the academic program provided focuses mainly on the different patient pathology that may be encountered in the different theatres and tailoring an anaesthetic for differing patient profiles. Even though the anaesthetic chart is an important part of patient care, very few lectures in the academic program focus on adequate and concise completion of the chart. Registrars do not receive regular training on chart completion and the interns rotating through the department on a two-month basis, having the least experience in anaesthesia, are often given the task of completing the chart. These factors often lead to substandard completion of charts in the department. This problem is known and ongoing but has never been quantified. This study aims to have an audit of the charts from all theatre complexes using a checklist adapted from the ANZCA and SASA guidelines as the standard of completion.

4.2 Aim and objectives

4.2.1 Aim

The aim of the study is to audit the anaesthetic charts at CHBAH using a modified checklist adapted from the SASA and ANZCA guidelines.

4.2.2 Objectives

The primary objectives of this study are to**:**

- Audit the anaesthetic charts at CHBAH and assess for adequacy using a checklist adapted from the ANZCA and SASA guidelines.
- Assess different factors that may play a role in the adequacy of chart completion i.e-
    - Day shift versus night shift
    - Regional anaesthesia versus general anaesthesia
    - Paediatric versus adult patients

4.3 Research assumptions

The following definitions will be used in this study.

Anaesthetist: is any qualified doctor working in the Department of Anaesthesiology including interns, medical officers, registrars and consultants.

Intern: is a doctor who completed a university degree but is currently undergoing practical training prior to registration with the Health Professionals Council of South Africa an independent practitioner.

Medical officer: is a qualified doctor practising in the Department of Anaesthesiology under specialist supervision. Medical officers with more than 10 years of experience are career medical officers and are regarded as consultants.

Registrar: is a qualified doctor who is registered with the Health Professional Council of South Africa as a trainee anaesthetist.

Anaesthesiologist: a qualified medical doctor registered with the HPCSA as a specialist anaesthesiologist.

Consultant: is an anaesthesiologist or career medical officer.

Adult: is a person 18-years and older.

Child: is a person younger than 18 years

Day shift: an 8-hour shift beginning at 08:00 and ending at 16:00.

Night shift: a 16-hour shift beginning at 16:00 and ending at 8:00

.

4.4 Demarcation of study field

The study will be conducted in the theatre complexes of CHBAH affiliated with the University of the Witwatersrand situated in Soweto Diepkloof, the southern part of Johannesburg. The staff complement of the anaesthetic department at CHBAH comprises of 15 interns, 57 medical officers and registrars rotating at any given time and 41 consultants. The main theatre complexes are the JD Allen theatres which have 15 theatres, 11 of which are elective theatres and 4 are emergency theatres which run on a 24-hour basis. An average of 1500 cases are done monthly at the JD Allen theatres excluding the obstetrics and gynaecology theatres, St Johns eye theatres and remote sites such as cardiac catheterization laboratory and MRI and radiology suites. The anaesthetic charts audited will be from all the theatre complexes which, when combined, average a total of 2700 cases done monthly.

4.5 Ethical considerations

Approval to conduct the study was obtained from the Human Research Ethics Committee (Medical) and the Graduate Studies Committee of the University of the Witwatersrand. Approval was sought and granted from the Anaesthesia Head of Department at CHBAH. It was conducted in accordance with the declaration of Helsinki (15) and the South African Good Clinical Practice Guidelines (16). The study adhered to the Protection of Personal Information (POPI) Act where no

patient or medical professional information will be published or disclosed as part of the study (17)Each chart was allocated a study number and no identifying information recorded in the data collection sheet. Confidentiality was maintained as only the researcher and the supervisors will have access the raw data.

The data collected will be stored securely in a password protected data base for six years following completion of the study.

4.6 Research methodology

4.6.1 Research design

A descriptive, retrospective design will be followed in this study.

A descriptive study is a non-experimental approach to research where manipulation of variables is not possible (18). It can further be categorized according to the sequence of data collection which can either be retrospective or prospective.

A retrospective design measures a variable which has occurred in the past (18). This research is retrospective and descriptive in nature as charts already filled out in the past will be assessed and audited and there will be no manipulation of variables.

4.6.2 Study population

The study population will be the anaesthetic charts filled out for both elective and emergency procedures in all the theatre complexes at CHBAH where an anaesthetic is administered by a member of the anaesthetic department.

4.6.3 Study sample

Sample size

The sample size was determined in consultation with a biostatistician and is based on the proportion of complete charts. Based on the literature the majority of anaesthetic charts did not meet the recommendations as per published guidelines. Only 30% of the evaluated charts were deemed complete. Assuming the average

of number of charts completed is 2700 monthly, the minimum sample size for a power of 80% and a precision of 3% is 112 charts per month. Therefore, the total number of charts for the three months chosen would be 336. This sample was calculated with Epi info version 6.

Sampling method

To try and eliminate sampling bias, probability sampling methods will be used, specifically stratified random sampling where the year will be divided into three different strata and a sample of charts will be taken from each stratum. The strata will be based on the registrar and intern rotations that the academic year is broken into. Data will be collected at three different months in the year 2019. The months will be January, May, and August 2019. These months are part of three different registrar rotations to target three different groups of registrars and interns. The months were chosen on the basis that they all have 31 days, one public holiday and four weekends thus the number of cases done in those months should be similar. Within each month, systematic sampling methods will be used where a chart is chosen at a specific interval, in this case every 18th chart will be audited. When every 18th chart is audited, it allows a large spread of charts over the month to be audited and when this interval is repeated within a month, chart sampling falls on every day of the week. The charts will be audited using a 53-point checklist adapted from the ANZCA and SASA guidelines. The charts will be deemed adequate if they meet the criteria for completion as per guidelines. Adequacy will be defined as the chart meeting 100% of the guideline requirements. As this is highly unlikely the charts will be grouped as those scoring 75-99%; 50-74% and less than 50% complete. The data collection sheet that will be used in this study is peer reviewed by three senior specialists in the department and their input provided what they deemed to be the minimum requirements the chart should have in the context of our study. Taken into consideration in the data collection sheet was an MMED previously done in the department of anaesthesia titled "Development and validation of an instrument for essential information for anaesthetic records." This study focused on developing a standardised anaesthetic chart with the minimum required essential information for the South African context

Inclusion and exclusion criteria

Anaesthetic charts filled out for elective and emergency procedures in all the theatre complexes at CHBAH were included in the study.

4.6.4 Data analysis

Data will be captured using a Microsoft Excel® spreadsheet in conjunction with a biostatistician. A descriptive analysis will be done using frequency and proportion tables, as well as bar graphs, to describe the categorical variables. Continuous variables will be summarized using means and standard deviations or medians and interquartile ranges where appropriate based on the distribution of the data. Comparisons between groups, e.g., neuraxial versus general anaesthetic charts, will be done using tests of proportions in the form of the independent Student T test and ANOVA for parametric data and the Mann-Whitney and Wilcoxon's signed rank test for nonparametric data. P-values less than 0.05 will be considered statistically significant for differences between compared groups. Stata® version 15 software will be used to carry out the descriptive and comparative analyses.

4.7 Significance of the study

The study aims to investigate the completeness of anaesthetic charts as per ANZCA and SASA guidelines. Not only is the anaesthetic chart a medicolegal document but adequate documentation and chart completion also helps colleagues in the anaesthetic department identify patients who are potential high anaesthetic risks from previous charts. After this study completed and the results obtained hopefully chart documentation will improve, and the department could potentially have regular audits to improve the quality of charting. The intern ESMOE week could potentially start incorporating a lecture on appropriate charting and the importance of perioperative documentation.

4.8 Validity and reliability of the study

Validity and reliability are concepts used to evaluate the quality of research. Validity is concerned with the accuracy and truthfulness of scientific findings (18). Reliability is concerned with consistency, stability and repeatability of the informants' accounts, as well as the researcher's ability to collect and record information accurately (18).

The validity and reliability of the study will be ensured by:

- Appropriate sample size

- Appropriate study design
- Using consistent measure to assess completeness i.e., the data collection sheet based on ANZCA and SASA guidelines
- Statistics analysis done in conjunction with a biostatistician.

4.9 Potential limitations

- Only three months of data collection.
- Charts damaged due to the storage process e.g., fading out becoming illegible.
- Charts not returned to the department; either left in other wards or lost in the transportation process of the patient.

4.10 Project outline

4.10.1 Time frame

Activity	Nov-Dec 2019	Jan-Feb 2020	Mar-Apr 2020	May-Jun 2020	Jul-Aug 2020	Sep-Oct 2020	Nov-Dec 2020	Jan-Feb 2021	Mar-Apr 2021	May-Jun 2021	Jul-Aug 2021
Proposal preparation											
Literature review											
Proposal submission											
Ethics approval											
Postgraduate approval											
Data collection											
Data analysis											
Draft article											
Submission											

4.10.2 Budget

Item	Price per page	Number of pages	Copies	Total
Proposal	R1	20	6	R 120
Ethics	R1	20	2	R 40
Post graduate form	R1	2	6	R 12
Complete report	R1	80	4	R 320
Grand total				**R 492**

The Wits Department of Anaesthesiology will incur the costs of paper and printing.

4.11 References

(1) Australian and New Zealand College of Anaesthetists. 2020. Guideline on the anaesthesia record. Available: https://www.anzca.edu.au/getattachment/7a980821-2346-4659-80ab-b85c209d8254/PS06-Guideline-on-the-anaesthesia-record-(PILOT) [Accessed on 03.06.2021].

(2) Sundararaman LV, Desai SP. The Anesthesia Records of Harvey Cushing and Ernest Codman. *Anesth Analg*. 2018; 126(1):322-29. DOI: 10.1213/ane.0000000000002576.

(3) Curtis WB, Sethi R, Visvanathan T*, et al.* Peri-Operative Anaesthetic Documentation: A Report of Three Sequential Audits on the Quality of Outcomes, with an Insight Into Surrounding Legal Issues. *Turk J Anaesthesiol Reanim*. 2018; 46(5):354-61. DOI: 10.5152/tjar.2018.40222.

(4) Raff M. An audit of anaesthetic record keeping. *South Afr J Anaesth Analg*. 2003; 9(3):7-9. DOI: 10.1080/22201173.2003.10873005.

(5) South African Society of Anaesthesiologists. 2018. South African Society of Anaesthesiologists. Practice Guidelines 2018 Revision. Available: http://129.232.161.218:40003/Document/SASAPracticeGuidelines2018_636595555116913425.pdf [Accessed on 21.11.2019].

(6) American Society of Anaesthesiologists. 2018. Statement on Documentation for Anaesthesia Care. Available: https://www.asahq.org/standards-and-guidelines/statement-on-documentation-of-anesthesia-care [Accessed on 23/01/2020].

(7) Elhalawani I, Jenkins S, Newman N. Perioperative anesthetic documentation: Adherence to current Australian guidelines. *J Anaesthesiol Clin Pharmacol*. 2013; 29(2):211-5. DOI: 10.4103/0970-9185.111726.

(8) Vigoda MM, Lubarsky DA. The medicolegal importance of enhancing timeliness of documentation when using an anesthesia information system and the response to automated feedback in an academic practice. *Anesth Analg*. 2006; 103(1):131-6, table of contents. DOI: 10.1213/01.ane.0000221602.90315.49.

(9) Edwards K, Hagen S, Hannam J*, et al.* A randomized comparison between records made with an anesthesia information management system and by hand, and evaluation of the Hawthorne effect. *Can J Anaesth*. 2013; 60(10):990-7. DOI: 10.1007/s12630-013-0003-y.

(10) Health Professions Council of South Africa. 2016. Guidelines For Good Practice In The Health Care Professions. Guidelines On The Keeping Of

Patient Records. Booklet 9. Available: http://www.hpcsa.co.za [Accessed on 12.10.2019].

(11) Roach V, Lau T, Ngan Kee W*, et al.* Perioperative documentation: are we doing enough? *Aust N Z J Obstet Gynaecol*. 1998; 38(2):166-9. DOI: 10.1111/j.1479-828x.1998.tb02993.x.

(12) Olateju S, Adenekan A, Owojuyigbe A. The effect of teaching on the completeness of the anaesthesia record charts for obstetric subarachnoid blocks in a low resource hospital. *J Obstet Anaesth Crit Care*. 2015; 5(1):16-21. DOI: 10.4103,2249-4472.155194.

(13) Cohen MM, Rose DK, Yee DA. Changing anesthesiologists' practice patterns. Can it be done? *Anesthesiology*. 1996; 85(2):260-9. DOI: 10.1097/00000542-199608000-00006.

(14) Greco PJ, Eisenberg JM. Changing physicians' practices. *N Engl J Med*. 1993; 329(17):1271-3. DOI: 10.1056/nejm199310213291714.

(15) World Medical Association. 2001. World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. Available: https://apps.who.int/iris/handle/10665/268312 [Accessed on 2/02/2019].

(16) Department of Health. 2006. Department of Health Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa. Available: http://www.kznhealth.gov.za/research/guideline2.pdf [Accessed on 4/01/2020].

(17) Government Gazette. 2013. Protection of Personal Information Act, Act No. 4. Available: https://www.gov.za/sites/default/files/gcis_document/201409/3706726-11act4of2013protectionofpersonalinforcorrect.pdf [Accessed on 21/02/2020].

(18) Brink H. Fundamentals of Research Methodology for Healthcare Professionals. Ch. In: 4 ed ed.: Juta and Company (Pty) Ltd, 2018, p. 110.

4.12 Appendices

Appendix 1: Data collection sheet

Chart domain	**Chart number: _____** **Chart illegible ■**	**Score**
Demographics		
Name	Yes/no	1
Hospital number	Yes/no	1
Date	Yes/no	1
Age/ DOB	Yes/no	1
Gender	Yes/no	1
Surgeon/proceduralist	Yes/no	1
Anaesthetist	Yes/no	1
Weight	Yes/no	1
Height	Yes/no	1
Procedure	Yes/no	1
Total		**/10**
Preop assessment		
Baseline observation	Yes/no	1
Patient co morbidities	Yes/no	1
Concurrent medications	Yes/no	1
ASA status	Yes/no	1
Previous anaesthetic	Yes/no	1
Allergies	Yes/no	1
Fasting status	Yes/no	1
Examination	Yes/no	1
Airway assessment	Yes/no	1
Relevant investigations	Yes/no	1
Premedication	Yes/no	1
Patient consent indicated	Yes/no	1
Total		**/12**
Intraoperative charting		
Anaesthetic technique	Yes/no	1
Sequence of events	Yes/no	1
Fluid therapy e.g., fluid type	Yes/no	1
IV access	Yes/no	1
Airway maintenance (size and type) e.g.LMA size 4.0*	Yes/no Yes/no	1 1
Breathing system e.g., circuit type* Ventilation settings* vent technique (PCV/SIMV)*	Yes/no Yes/no Yes/no	1 1 1
Duration of anaesthetic	Yes/no	1
Duration of procedure	Yes/no	1
Drugs Dosages Timing	Yes/no Yes/no Yes/no	1 1 1
Patient position	Yes/no	1
Monitoring (correct 5-minute intervals) BP MAP Pulse Sats etCO2 (if applicable) * etAA (if applicable) * Temp	Yes/no Yes/no Yes/no Yes/no Yes/no Yes/no Yes/no Yes/no Yes/no	1 1 1 1 1 1 1 1 1
Blood loss	Yes/no	1
Urine output	Yes/no	1
Complications	Yes/no	1
Total		**/28**
Post op events		
Vitals CVS Resp	Yes/no Yes/no	1 1
Neurological status	Yes/no	1
Total		**/3**
Total score		**/53**

Appendix 2: Head of Department approval letter

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL
DIRECTORATE - ANAESTHESIA
Enquiries: Dr P. Mogane
Tel. number: (011) 933-9334
Email: Palesa.Mogane@wits.ac.za

Department of Anaesthesiology
Chris Hani Baragwanath Academic Hospital
PO Bertsham
2013
6TH July 2020

To whom it may concern

RE: PERMISSION TO CONDUCT RESEARCH

This serves to confirm that I grant permission for Dr Nkadimeng to conduct research involving the Department of Anaesthesia at the Chris Hani Baragwanath Academic Hospital. The research topic is titled: An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital.

I'd like to wish her luck in this endeavor and I am happy to support her wherever possible.

Kind regards.

Dr Palesa Mogane
Chief specialist and Head of Department
Department of Anaesthesiology
Chris Hani Baragwanath Academic Hospital
University of Witwatersrand
Email: Palesa.Mogane@wits.ac.za

Appendix 3: Medical Advisory Committee approval letter

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 8th July 2020

TITLE OF PROJECT:

An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital

UNIVERSITY: Witswatersrand

Principal Investigator: Dr L Nkadimeng

Department: Anaesthesia

Supervisor : Dr L Gilliland

Permission Head Department (where research conducted): Yes

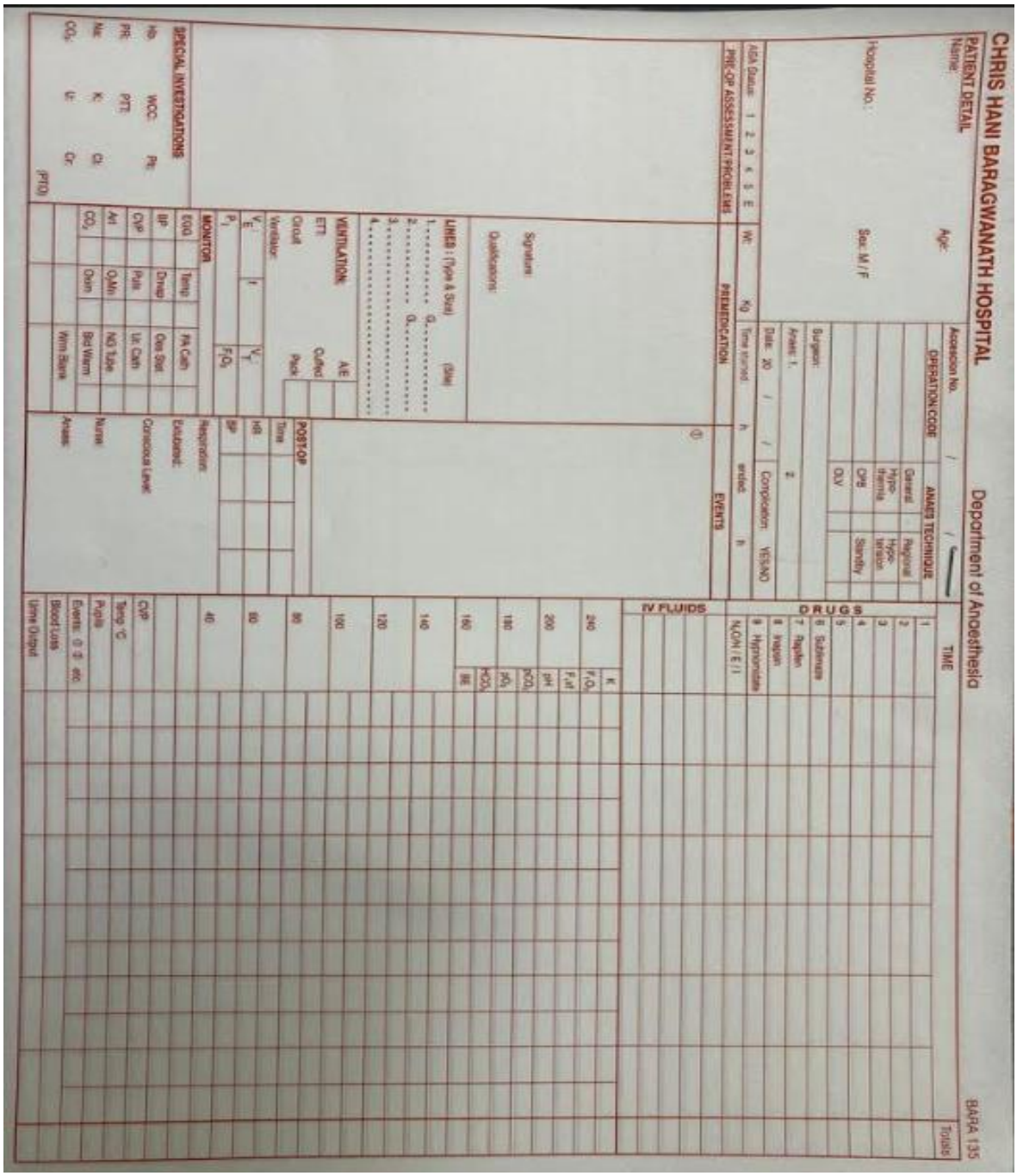
The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

.....
Recommended
(On behalf of the MAC)
Date: 8/7/2020

.....
Approved/~~Not Approved~~
Hospital Management
Date: 09/07/2020

Appendix 4: Anaesthetic chart



Section 5: Annexures

5.1 Ethics Approval

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

R14/49 Dr L Nkadimeng

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200839

NAME: (Principal Investigator)	Dr L Nkadimeng
DEPARTMENT:	School of Clinical Medicine Department of Anaesthesiology Medical School University
PROJECT TITLE:	An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital
DATE CONSIDERED:	28/08/2020
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Drs L Gilliland, D Nel and M Mashinini
APPROVED BY:	Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2020/10/05

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **August** and will therefore reports and re-certification will be due early in the month of **August** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

5.2 Graduate studies approval

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Private Bag 3 Wits, 2050
Fax: 027117172119
Tel: 02711 7172076

Reference: Mrs Sandra Benn
E-mail: sandra.benn@wits.ac.za

03 August 2020
Person No: 300884
PAG

Dr LM Nkadimeng
309 Meyersig Lifestyle Estate
Cnr JG Strydom & Kliprivier
Bracken Downs
1448
South Africa

Dear Dr Lebohang Nkadimeng

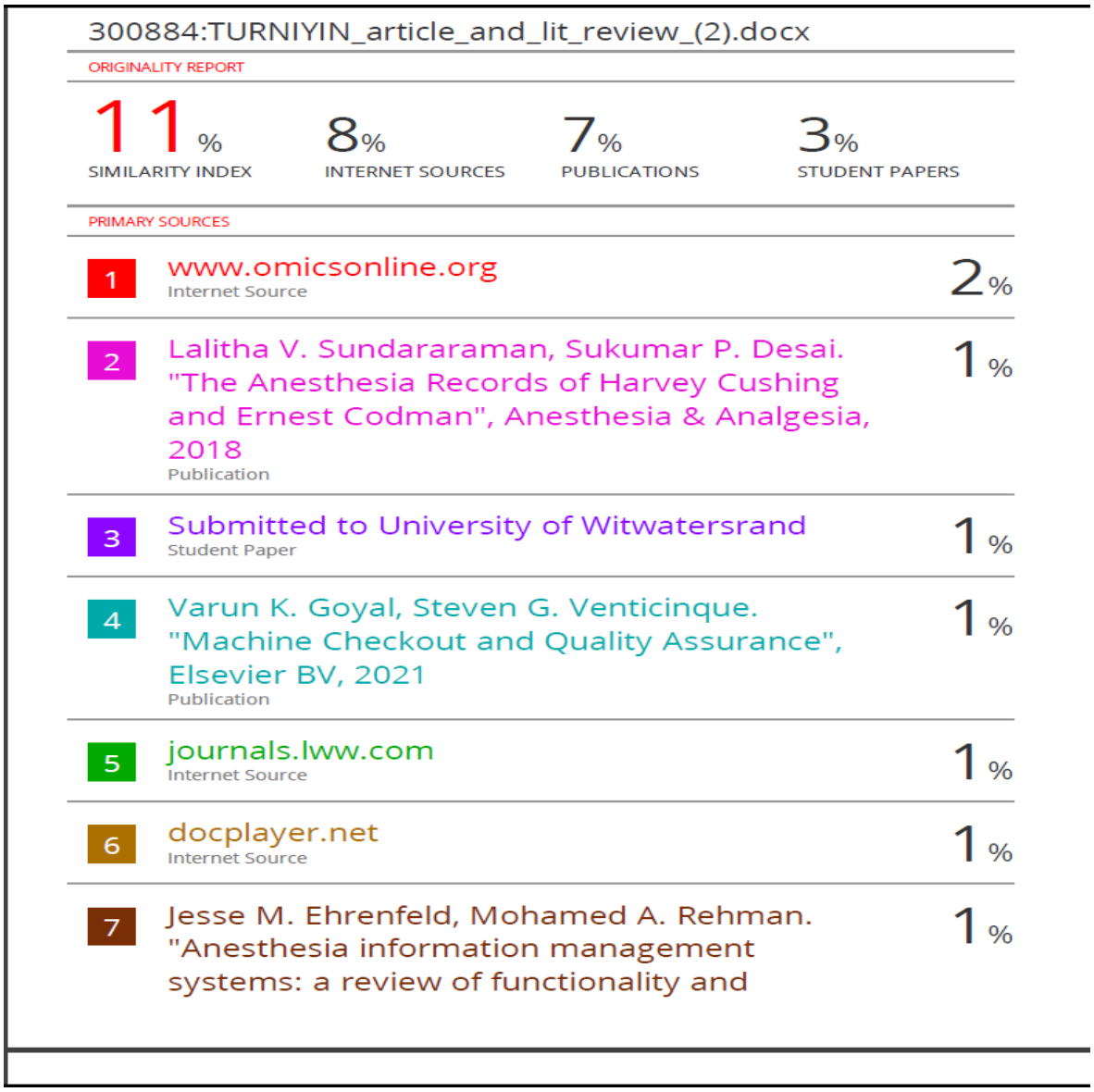
Master of Medicine in Anaesthesia: Approval of Title

We have pleasure in advising that your proposal entitled *An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital.* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely

Mrs Sandra Benn
Faculty Registrar
Faculty of Health Sciences

5.3 Turnitin report



300884:TURNIYIN_article_and_lit_review_(2).docx

ORIGINALITY REPORT

11%	8%	7%	3%
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