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ORIGINAL RESEARCH

An audit of anaesthetic charts at Chris Hani Baragwanath Academic Hospital

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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: This audit assessed adequacy of completion of anaesthetic charts for 2019. Using a peer-reviewed checklist adapted from guidelines by the Australian and New Zealand College of Anaesthetists (ANZCA) and the South African Society of Anaesthesiologists (SASA). 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, however, scored 100% and the overall median score was 77%. Charts were subdivided into three groups. Those scoring 75–99% (n = 212), those scoring 50–74% (n = 121) and those that were less than 50% complete (n = 0). Patient category (adult vs paediatrics), time of shift (day vs 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: The audited charts scored higher than charts in 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 could potentially lead to improved perioperative patient care and mitigate medicolegal risks.

Keywords: anaesthesia, audit, anaesthetic charts

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 the patient presenting for 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] It is often the sole documentation that the anaesthesiologist has of 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 Society of Anaesthesiologists (SASA).[9] These societies all stipulate the importance of good record keeping. They emphasise the documentation of the preoperative patient visit (including history and examination), intraoperative events and postoperative anaesthesia care. They also all require perioperative complications to be documented and explained.

Both local and international audits have revealed inadequate documentation on the anaesthetic charts even with published guidelines for chart completion.[3,10-12] Some studies have shown that up to 11% of the time in theatre can be dedicated to manual chart completion, and this is believed to contribute to inadequate documentation.[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 lawsuit.[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 be used as teaching opportunities.

The adequacy of completion of anaesthetic charts at the Chris Hani Baragwanath Academic Hospital (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 postgraduate 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 and the South African Good Clinical Practice Guidelines.[18,19] 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, 2 700 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. The total number of charts selected over a three-month period was 336. This specific sample size was calculated with Epi Info™ (CDC, USA, 2016).

There is an anaesthetic chart for every patient who had an anaesthetic administered. 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 documenting a general or spinal anaesthetic, from all theatres at CHBAH, were included in this study. Charts documenting sedation as the sole anaesthetic technique were excluded. The data collection tool was not developed to include details about sedation; hence, these charts will be incorrectly classified as incomplete.

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 were collected during three different months of 2019, namely, January, May and August. These months were part of three different registrar rotations to target three different groups of registrars and interns. The months were chosen based on the fact that these all had 31 days, one public holiday and four weekends thus the number of cases performed during these months should be similar. Within each month, systematic sampling methods were used where charts were 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, although it was unlikely that the charts would meet this criterion. The charts were grouped into three categories: those scoring 75–99%; those scoring 50–74% and those 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 were captured using a Microsoft Excel spreadsheet. A descriptive analysis was performed using frequency and proportion tables, as well as bar graphs to describe the categorical variables. Continuous variables were summarised using means and standard deviations (SDs), or medians and interquartile ranges (IQRs) 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's t-test and *p*-values less than 0.05 were considered statistically significant. Linear regression analysis was done to assess for a causal relationship between variables thought to contribute to chart completion.

Results

A total of 336 charts were audited for 2019. Three charts were excluded as they documented procedures performed under sedation, which brought the total number of charts audited to 333. 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 (Tables I–III).

The overall median score for chart adequacy was 77% with an IQR of 72–81. Based on the overall scores, the charts were grouped into three categories: those scoring 75–99%, those

Table I: Percentage scores of demographics and preoperative assessment variables

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

scoring 50–74% and those scoring 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 75–99% and 121 (36.4%) scored 50–74% (Figure 1).

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

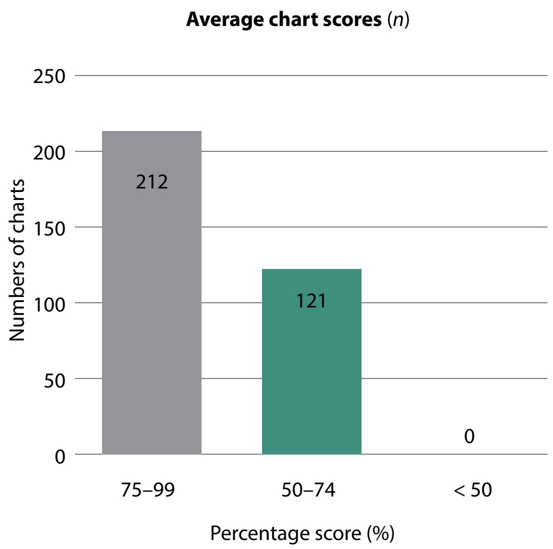

Figure 1: Average chart scores

Table II: Percentage scores of variables comprising intraoperative documentation

Intraoperative documentation	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 CO_2*	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 III: Percentage scores of variables comprising postoperative documentation

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

normally distributed; hence, we used the median and 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 (Table IV).

Patient category, time of shift and type of anaesthetic were audited, and considered variables that could potentially affect chart completeness. These 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, SD and t-test were therefore used to compare the percentage scores for adequacy of completeness between the different categories (Table V).

Table IV: Chart scores as per different sections

Section	Percentage complete (%) Median (IQR)	Percentage complete (%) Minimum	Percentage complete (%) Maximum
Demographics	90 (80–90)	60	90
Preoperative assessment	67 (50–75)	8	100
Intraoperative documentation	79 (73–82)	54	96
Postoperative monitoring	100 (100–100)	0	100
Overall	77 (72–81)	51	91

Table V: Comparative scores of different variables affecting chart completion

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

Table VI: Linear regression analysis

Variable	Category	Crude estimates		Adjusted estimates	
		-coefficient (95% CI)	*p*-value	-coefficient (95% CI)	*p*-value
Patient category	Adult	0 (Ref)		0 (Ref)	
	Paediatric	-2.19 (-3.79; -0.59)	0.007	-2.39 (-4.11; -0.67)	0.007
Shift	Day	0 (Ref)		0 (Ref)	
	Night	0.088 (-1.37; 1.54)	0.91	-0.073 (-1.52; 1.38)	0.92
Type of anaesthetic	General	0 (Ref)		0 (Ref)	
	Regional	0.32 (-1.36; 2.00)	0.71	-0.56 (-2.35; 1.23)	0.54

95% CI – 95% confidence interval

Linear regression analysis was done to further assess if there was a causal relationship between patient category, shift and type of anaesthetic, and chart completion. The variable with statistical significance was patient category with a *p*-value of 0.007 (Table VI).

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 on the quality of patient care.[2,3,11]

The main finding of 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.[11] had chart completion ranging from 25.5–35.1% over a five-year period. Studies done by Raff and James in Cape Town South Africa,[10] and Elhalawani et al. in Australia,[3] reported median chart completion scores of 29% and 32%, respectively.

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.[23] 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.

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.[23] where body mass index (BMI) was recorded in 1.2% and pre-induction vitals were recorded in 37.5% of their charts. 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.[24] and Raymer et al.[25] reported that chart design influences the adequacy of chart completion, where a user-friendly logical design promotes chart adequacy. In this study, the chart design is a combination of both a structured and an 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 may be 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 simulations after a night shift, it was shown that increased sleepiness decreased nontechnical skills, of which documentation is one.[26] However, the findings in this study 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 Elhalawani et al.[3] and 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, however, adult cases had statistically significant better chart documentation compared to paediatric cases (p-value < 0.0074).

Study limitations

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

The design of the data collection tool led to the exclusion of charts that documented sedation as the sole anaesthetic technique. This design could be modified in subsequent audits to avoid the exclusion of any charts.

This study could not assess other factors that may affect chart completion such as elective versus emergency procedures, number of anaesthetists in the theatre and the presence of intraoperative complications. These variables are infrequently documented, and this may be influenced by the chart design.

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 younger than 18 years and weighing less than 40 kg.[28] Omission of height from a chart for paediatric anaesthesia is thus not of the same importance as omission of some other variables such as the weight of the patient.

Conclusion

The anaesthetic charts audited at CHBAH scored higher 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 < 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 anaesthetists.

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Conflict of interest

The authors declare no conflict of interest.

Ethical approval

Ethical approval was obtained from the University of the Witwatersrand Human Research Ethics Committee (Ref: 200839).

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Appendices available online.