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ORIGINAL ARTICLE

An assessment of the quality of clinical records in elective orthopaedics using the STAR score

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Abstract

Background Litigation claims related to surgery have increased significantly in recent years. Despite the medico-legal importance of clinical records, there have been few published studies describing the quality of medical records in orthopaedic surgery. This study aimed to evaluate the quality of clinical note taking in an elective orthopaedic setting over a 10-year period by comparing medical records from 2003 and 2013.

Methods We used the previously validated Surgical Tool for Auditing Records (STAR) on a sample of 20 medical records from each year. We performed statistical analysis to determine if significant differences existed between 2003 and 2013.

Results There was an overall improvement in the quality of medical records from 76.7% (range 68–82%) in 2003, to 81% (range 72–88%) in 2013 (P value < 0.05). There were significant improvements in the subsequent entry score, from 5.15 to 6.3 (P value < 0.05) and discharge summary score, 6.65 to 7.95 (P value < 0.05). The score for the operative record section decreased from 8.45 to 8.0 (P value < 0.05).

Conclusion The overall standard of medical records in both 2003 and 2013 was high and comparable to other surgical specialties. There was no possible correlation observed between standards of medical records and increasing litigation claims in surgery. Widespread implementation of Electronic Medical Records (EMRs) is likely to have a significant impact on the quality of medical records. Further research is required to determine how the design of EMRs influences how healthcare professionals record data.

Keywords Electronic medical records · Medical note taking · STAR score

Background

The continuing development of Electronic Medical Records (EMRs) is set to revolutionise the way doctors record and interpret patient data [1, 2]. While some early EMR systems have led to inefficient and time consuming practices for doctors [3] emerging technologies relating to big data, artificial intelligence and clinical language understanding offer significant potential benefits from the digitization of medical records [1].

There has been much discussion regarding these new technologies in the implementation of EMRs; however, relatively few studies have focused on the state of current clinical note taking by doctors, which will ultimately inform any future technologies. There have been few published studies assessing the quality of note taking in orthopaedics [4]. Regular auditing of medical records has been shown to improve standards of documentation [5, 6]. This has led to the development of a number of tools to assess the quality of medical note taking across a range of specialties in medicine and surgery [5, 7].

The importance of accurate medical note taking is highlighted by their use as legal documents. Despite this, clinical documentation standards are highly variable across different hospital settings and often insufficient when reviewed in medico-legal cases [8–10] As orthopaedics has one of the highest levels of litigation among surgical specialties, high-quality medical records are important for both patient care and

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medico-legal enquiries [11]. A recent study of elective knee surgery in the United Kingdom (UK) showed significant increases in payouts from litigation over the past 15 years [12]. Another study of surgical litigation claims in the UK showed a 66% increase in claims from 2008 to 2012 with orthopaedic surgery having the highest incidence of claims [13].

Given these upward trends in the incidence of surgical litigation in recent years, we aimed to assess the quality of clinical note taking over a 10-year period from 2003 to 2013 to determine if changes over time could be a contributing factor to the increasing risk of litigation.

Materials & methods

We carried out a retrospective observational study of the quality of clinical note taking using the Surgical Tool for Auditing Records (STAR) method [6]. The STAR method is based on the Royal College of Surgeons guidelines on medical record taking and consists of 50 components that should form part of surgical patient records [6]. The number of incomplete or illegible components are counted and deducted from 50. The STAR method scoring sheet features six sections with corresponding percentage weighting. These include; admission (20%), subsequent entries (16%), consent (14%), anaesthetic record (14%), operative record (18%) and discharge summary (18%). Up to four entries are accountable in the subsequent entry section with the scores then averaged. Documentation of the patient name, medical record number, date and name of doctor are included in the majority of sections. The presence of two illegible words will result in a lost score for legibility. The components of the STAR method are shown in Fig. 1.

The study was performed in March 2014 in Cappagh National Orthopaedic Hospital. This Hospital is the largest elective orthopaedic hospital in Ireland where a wide range of orthopaedic surgical procedures are performed. The hospital used an electronic clinical record system (Bluespier International Ltd.) for specific aspects of patient records including the operative note. In 2013, this was extended to incorporate the discharge summary and changes to the format of the operative note also occurred. The initial clerking and subsequent entries were handwritten on standard clinical note sections. The consent and anaesthetic record were handwritten on standard forms which did not change significantly over the study period.

Twenty consecutive charts were selected from the medical record department for patients who were treated and discharged in each of the years 2003 and 2013. Our inclusion criteria were patients who had a surgical procedure requiring an inpatient stay at the hospital. Patients that did not have a surgical procedure and day-surgery patients were excluded. Charts were consecutively selected and analysed for satisfaction of inclusion criteria until a total of 20 charts for each year were collected.

The STAR method was piloted independently by two authors (NP, LC), on one patient chart from 2003 to check for agreement and identify areas susceptible to differences in interpretation. This resulted in clarification of criteria for awarding scores in the following two components. Firstly, for "Date and Time", writing the date but not the time resulted in a deduction. Secondly, the "Name/Bleep/Post" component was awarded if the name was written legibly even if the bleep number and/or post were omitted.

Each medical record was assessed by a single author (LC). The mean score and range were calculated for each section of the STAR score and compared between 2003 and 2013. The two-sample unpaired t-test was used to compare means. All statistical analysis was performed using Stata Version 13 (Statacorp, Texas, USA).

Results

The total STAR score for 2003 sample was 1534 out of a maximum of 2000, returning a mean of 76.7/100 (range 68 to 82, SD 3.51). The total STAR score for 2013 sample was 1620 out of a maximum of 2000, returning a mean of 81/100 (range 72 to 88, SD 5.60). The overall results for both years are compared in Fig. 2.

Table 1 shows the mean score and range for each section of the STAR score for 2003 and 2013. The *P* value was calculated using the two-sample unpaired *t* test for variables with equal variance.

There was a statistically significant improvement in the total score, subsequent entries and discharge summary between 2003 and 2013. There was also a statistically significant lower score for operative record in 2013.

Detailed analysis of initial clerking showed the majority of deductions in both years were caused by the omission of the referral source, working diagnosis and writing the date but not the time. Deductions for subsequent entries were found to include the omission of the patient name/hospital number, signature/name/bleep/post and heading. An addressograph sticker which includes the patient's name, hospital number and consultant is normally attached to the top of each continuation sheet; however, in some cases, this was only present on the first page but not on subsequent pages. Points were also deducted for illegible handwriting and signatures.

Deductions in the consent section were primarily due to omission of the benefits and risks/complications as these are not usually specified on the form. Deductions for operative records were low and mainly due to omission of the diagnosis post procedure.

Analysis of the discharge summary section showed that in 2003 deductions were mainly due to omission of the

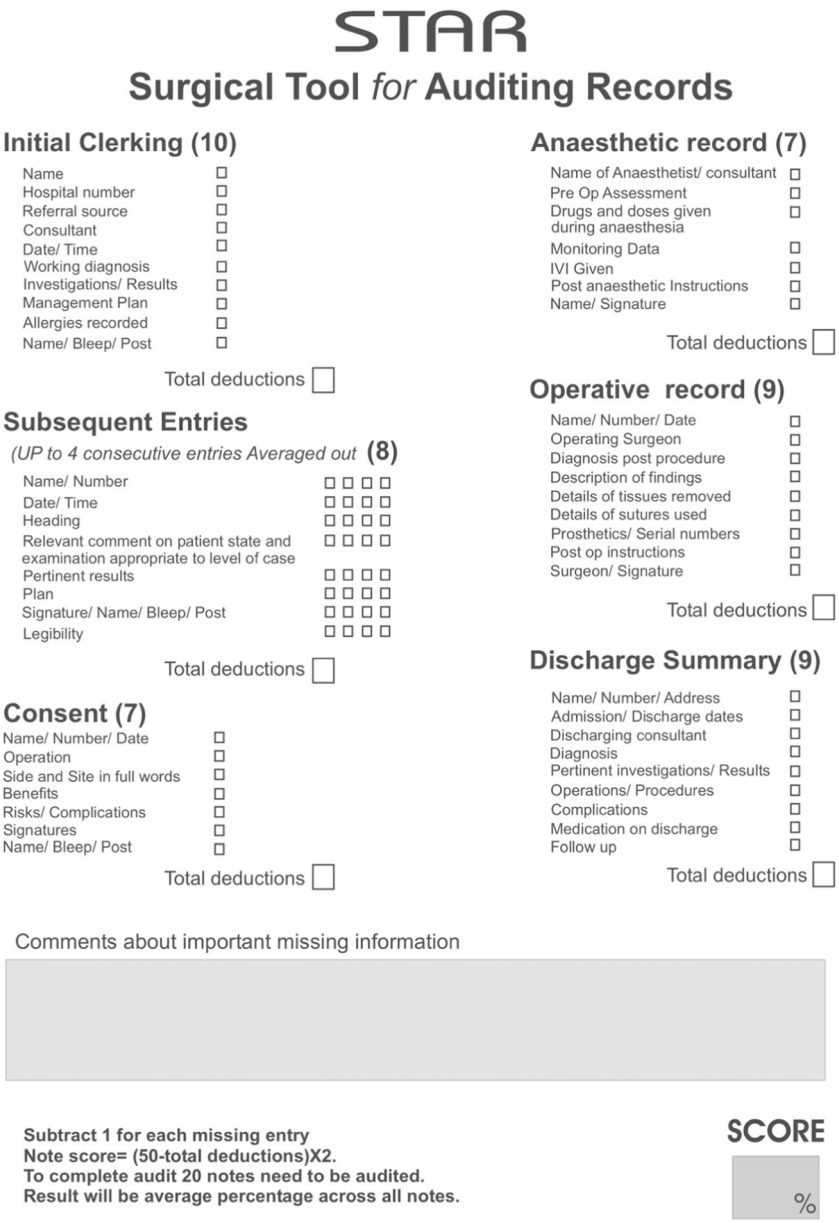

Fig. 1 The Surgical Tool for Auditing Records (STAR)

complication and medication sections while in 2013 these were included in 100% of discharge summaries for charts from that year (Fig. 3).

Discussion

The standard of note taking in elective orthopaedics in this study is similar to the findings from studies of other surgical specialties. The overall STAR score for 2013 of 81% (range 72%–88%) is comparable to a study of vascular surgery patients in which 20 consecutive medical records were analysed with an average score of 83.34% (range 68.5 to 94%) [6]. Unlike the present study, Tuffaha et al. implemented an improved proforma for note taking, provided education for doctors and improved the filing system for records before repeating the STAR assessment. They found a significant increase in the STAR score following these measures to an average of 98% [6].

While no specific intervention was taken to improve medical note taking during this retrospective study, there were some changes to the electronic patient record system used by the hospital and these were reflected in the results. The discharge summary section accounted for the greatest improvement in the STAR score over the 10-year period. It represented 20% of deductions in 2003 but only 11% in 2013. A structured format for discharge summaries was incorporated into the EHR between 2003 and 2013. This new format included sections for complications and medication lists to be inputted. There were subsequently no

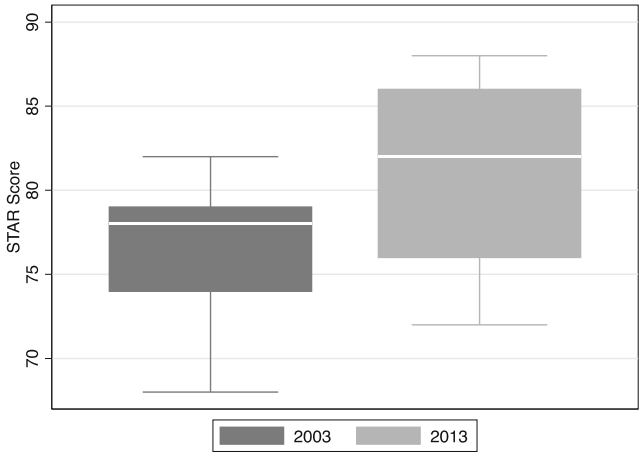

Fig. 2 Boxplot of total STAR scores for 2003 and 2013

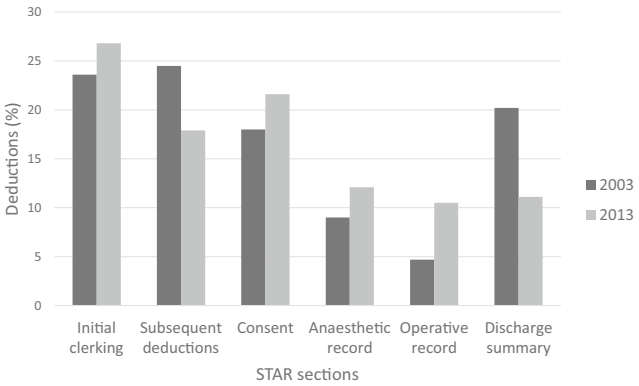

Fig. 3 Deductions from STAR score sections: 2003 versus 2013

deductions for omission of information in these areas in the 2013 results.

In contrast, a change to the format of required inputs in the operative record section between 2003 and 2013 may have resulted in a reduced score in 2013 with deductions increasing from 5 to 11%. Most of the deductions in 2013 were due to omission of the "diagnosis post procedure". In 2003, the diagnosis may have been a required input in a separate section of the operative note and was present in most records. In 2013, due to minor changes in the EHR system it was only required as an optional component and this could have resulted in the lower scores in this section for that year.

We recognise that a lower STAR score for 2013 operative records may not represent a lower quality of note taking as information informing diagnosis may have been inputted in the findings section. The STAR score is limited as it assesses only a small percentage of the entire clinical record. However, the previous examples do highlight how changes to EHRs, positive or negative, can have significant effects on the information recorded by healthcare providers in patient notes. Interestingly, these effects were detected by a standardised auditing tool such as STAR.

The initial clerking section was responsible for the greatest percentage of deductions in both 2003 and 2013, 24% and 27% respectively. This section was not part of the EHR in either year. Despite being responsible for a high proportion of deductions in this study it was a comparatively better score than the 41% of deductions recorded by Tuffaha et al. in their original findings. Some components of initial clerking section in the STAR score such as "referral source" may be more applicable to an emergency department admission or outpatient clinic and may not be relevant to elective orthopaedic initial clerking for inpatients. The reason for these deductions may also be due to time constraints for doctors during the initial clerking encounter and could be significantly reduced by an education and awareness campaign as part of an audit cycle.

Table 1 Results of STAR score for 2003 and 2013

STAR section (maximum score)	2003	2013	*P* value
Initial clerking (10)	7.25 (5–10)	7.45 (5–9)	0.6253
Subsequent entries (8)	5.15 (4–7)	6.3 (3–8)	0.0058
Consent (7)	4.90 (4–5)	4.95 (4–6)	0.5602
Anaesthetic record (7)	5.95 (5–7)	5.95 (5–7)	0.3040
Operative record (9)	8.45 (7–9)	8.0 (7–9)	0.0057
Discharge summary (9)	6.65 (4–9)	7.95 (6–9)	0.0004
Total score/100	76.7 (68–82)	81 (72–88)	0.0060

The consent for operative procedures required the patient to sign a standard consent form and was similar in both years studied. The deductions for consent in this study were higher than that of the comparative study by Tuffaha et al., 21% versus 2%. Any deductions for consent are worrying considering the potential for litigation if possible complication has not been discussed adequately prior to surgery [11]. The consent process may have been documented in other sections such as clinical correspondence letters and outpatient notes which the STAR score does not assess. However, the STAR score has highlighted an area where the introduction of a revised consent form could improve documentation levels.

The results of this study show that the quality of note taking in elective orthopaedics has remained stable and to a relatively high standard over a 10-year period. As this stability over time does not correlate with recent increases in surgical litigation claims, it is highly unlikely that note taking practices are responsible for these trends. Indeed, it may be entirely due to factors outside of any clinical practice such as changes to legal practices or patient attitudes [13].

A secondary finding of this study is the potential for EMRs to influence how clinical information is recorded by doctors and the subsequent impact on quality. Much of the current debate on EMRs appears to focus on increasing adoption and leveraging new technologies to improve inefficient means of inputting data [1, 14]. We believe that more attention should be paid to the quality of clinical records produced by

healthcare professionals using EMR systems and how this can be positively influenced by the design of such systems. This is particularly important when the potential for errors due to incorrect selections from menus provided by EMRs is considered. This has led to anxiety among physicians about the potential for errors with widespread EMR adoption [15].

Efficient electronic systems are difficult to create and have been shown in some cases to increase the time taken for documentation [16] and introduce errors [17]. Improvements in technology and further collaboration between healthcare professionals and software developers will undoubtedly lead to improvements in electronic medical record systems and their widespread replacement of handwritten records. We should also remember that simple measures such as the education of doctors in good record keeping practices, regular audit of medical records and the introduction of simple structured notes have been shown to significantly increase the quality of medical records [4–6]. Without these measures, the quality of note taking is likely to remain relatively static over time as highlighted by this study.

The study has recognised limitations including the relatively small number of medical records assessed and the setting of an elective orthopaedic hospital, which makes our results less generalisable to other clinical areas. A further limitation was the assessment of records by a single author although the STAR scoring system has been previously validated and shown to have a low interobserver variability [6].

Conclusion

This study shows a good standard of clinical note taking in orthopaedics similar to the finding in other surgical specialties. There was no declining trend observed in the standard of medical records that could explain increasing litigation claims in surgery. Changes to the design and use of EMRs appear to have an impact on the quality of medical records recorded. Further research is required to determine how the design of EMRs influences how healthcare professionals record data.

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Compliance with ethical standards

Conflict of interest Author Lava Chalikonda declares that she has no conflict of interest.

Author Nigel Phelan declares that he has no conflict of interest.

Author John O'Byrne declares that he has no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in the study.

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