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Implementation of a checklist to enhance operation note quality at a UK burns centre

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ABSTRACT

Introduction: Operation notes are fundamental for clinical, academic and medico-legal purposes. *Good Surgical Practice* (2014) provides guidelines to assist note completion but the literature suggests poor adherence to these. The aim of this study was to evaluate and improve operation note quality at a UK burns centre through implementation of a burns surgery-specific checklist.

Methods: A 22-component burns surgery-specific checklist, modified from *Good Surgical Practice* (2014), was designed and implemented. The quality of 80 operation notes (40 pre and 40 post-implementation) was assessed against this checklist. Fisher's exact and Mann-Whitney U statistical tests were used to evaluate pre and post-intervention note quality.

Results: Before checklist implementation, only 6/22 components (27.3%) were recorded on every note. 4/22 components (18.2%) were not recorded on any, including microbiology specimen and clinical photography, which are particularly important in burns. After implementation, 16/22 (72.7%) were recorded on every note, with a statistically significant improvement in all other components ($p \leq 0.01$), except venous thromboembolism prophylaxis ($p=0.10$). The median percentage score of components recorded improved from 78.2 to 100% ($p < 0.01$).

Conclusion: To our knowledge, this is the first study in available literature to show that a burns surgery-specific checklist can significantly improve burns operation note quality. This presents a simple and cheap method to improve note quality and may enhance post-operative intra/inter-team communication and patient care. At our unit, we have now developed an electronic checklist format with mandatory field completion to facilitate total compliance.

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1. Introduction

The operation note is a record of pertinent perioperative information, integral to multidisciplinary patient care following surgery [1]. A clear, complete note serves to avoid unnecessary delays or errors in management during the critical post-operative period and follow up [2]. By facilitating continuity of care, it can save both time and money in a strained healthcare service [3–5]. Operation notes are also frequently used as valuable sources of data for surgical research, clinical governance and in medico-legal cases [6].

The Royal College of Surgeons of England (RCSEng) revised and outlined the key components of an operation note in the *Good Surgical Practice (GSP)* guidelines (2014) [7]. Despite this, reports still reveal suboptimal adherence to these standards [8–11]. Poor quality of operation note has clinical, academic and legal implications. In a clinical setting, poor documentation can culminate in poor communication, which has been convincingly demonstrated as a key root cause for near misses, patient safety incidents and complaints [12,13]. In research, inadequate notes can introduce bias, compromising the validity of any findings [14]. From a medico-legal standpoint, the adage, "poor records mean a poor defence" [15], is fitting since around 45% of operation notes are potentially non-defensible in court [16].

Clearly, satisfactory completion of the operation note is important for both the patient and healthcare provider. Hence, it has been extensively investigated across surgical specialties and hospital sites [8–11]. Whilst burns surgery operation notes have been described as poorer in quality compared to some other specialties [17], no study thus far has focused exclusively on burns surgery and whether note quality can be improved. Moreover, unlike in breast or hip surgery for example, no national guidelines specific to burns surgery currently exist for this purpose [1,18].

The aim of this study was to evaluate operation note quality in a regional burns centre pre and post-design and implementation of a burns surgery-specific checklist, modified from *Good Surgical Practice* (2014).

2. Methods

2.1. Checklist design

A 22-component operation note checklist was designed based on *Good Surgical Practice* (2014) guidelines [7], modified to burns surgery. Components deemed critical to burns surgery included details on skin substitutes, microbiology specimen (site), donor site, pre-operative temperature, dressings, diet, ambulation/splinting, clinical photography, and graft/wound check date.

2.2. Data collection

Before checklist implementation, 40 operation notes at a London regional burns centre were retrospectively analysed. The compliance of the notes was evaluated against components to be included in the checklist. The grade of the surgeon completing the operation note was also recorded.

Once compliance was assessed, the checklist was implemented at the unit. Table 1 includes details on each of the components. Key stakeholders engaged include the nursing staff who ensured that a printed copy of the checklist was included prior to each case, alongside the anaesthetic documentation and World Health Organisation (WHO) Surgical Safety checklist. The surgeons were responsible for

Table 1 – Percentage of operation notes containing each component pre and post-checklist implementation.

Component	Notes with component (%)		p-Value
	Pre-implementation	Post-implementation	
Date	100	100	NS
Indication	65	100	<0.001
Name of operation	100	100	NS
Lead surgeon	100	100	NS
Assistant	72.5	100	<0.001
Anaesthetist	65.9	93	<0.001
Anaesthetic	60	92	<0.001
Skin substitutes	100	100	NS
Microbiology specimen	0	77	<0.001
Antibiotic	35	77	<0.001
Operation technique	100	100	NS
Donor site	93.1	100	0.01
Pre-operative temperature	0	100	<0.001
Closure	87.5	100	NS
Dressings	100	100	NS
Operation findings	95	100	NS
VTE prophylaxis	12.8	23	NS
Post-operative care	92.5	100	0.01
Diet	0	100	<0.001
Ambulation/splinting	30.6	100	<0.01
Clinical photography	0	8	0.01
Graft/wound check date	83.8	100	<0.001

completing the checklist after each operation to ensure that the operation note included all components. Post-implementation operation note quality was subsequently evaluated in a further 40 notes.

2.3. *Statistical analysis*

All statistical analysis was performed using SPSS (version 24.0; SPSS Inc, Chicago, IL). Fisher's exact statistical test was used to compare pre and post-implementation compliance based on paired categorical data for each component. A median was used as the measure of central tendency for nonparametric analysis. A Mann-Whitney U test was used to compare the overall compliance. A p-value <0.05 was considered significant.

3. Results

The percentage of operation notes containing each component pre and post-implementation of the 22-component checklist is shown in Table 1. The components not recorded on any note, pre-intervention, were: microbiology specimen, pre-operative temperature, diet, and clinical photography. Those very poorly recorded include: antibiotic usage (35%), ambulation/splinting (30.6%) and venous thromboembolism (VTE) prophylaxis (12.8%). Important components recorded suboptimally were: indication (65%), anaesthetic use (60%), closure (87.5%) and timing of graft/wound check (83.8%). Only 6 components (27.3%) scored 100%.

Following implementation, there were statistically significant improvements in all components except VTE prophylaxis, and 16 components (72.7%) scored 100% (Fig. 1). These included important improvements in documentation of indication, donor site, pre-operative temperature, closure, operation findings, post-operative care, and timing of graft/wound check. The components that did not achieve 100% were: microbiology specimen (77%), antibiotic usage (77%), VTE prophylaxis (23%) and clinical photography (8%). The median percentage score of components recorded improved from 78.2 to 100% ($p<0.01$).

Pre-intervention, 35/40 (87.5%) notes were completed by plastic surgeons and 5/40 (12.5%) notes were completed by Core Trainees (CT)/Senior House Officers (SHO). There was no statistically significant difference in compliance between plastic surgeons and CT/SHOs (overall median components compliance 63.6% versus 68.2%, $p=0.20$).

4. Discussion

Accurate completion of operation notes is crucial for clinical, academic and medico-legal reasons. A burns surgery-specific checklist was designed, implemented and resulted in significantly improved operation note quality at our burns centre. To our knowledge, this is the first study in available literature to show that a burns surgery-specific checklist can significantly improve burns operation note quality. Following intervention, 16/22 components (72.7%) were recorded on every note, compared to only 6 (27.3%) before, and there were statistically significant improvements in all other components except one.

This is consistent with findings from previous studies that likewise based standards on *Good Surgical Practice* (2014) [9–11]. One of the largest studies appraising operation note quality, which included orthopaedic operation notes from nine hospitals, found that electronic operation notes significantly improved recording compared to handwritten ones [8]. Notably, similar to our study, both antibiotic and VTE prophylaxis were poorly reported irrespective of documenting method and these were emphasised as potentially impacting patient safety. However, since this study primarily aimed to only assess operation note quality, there was no intervention

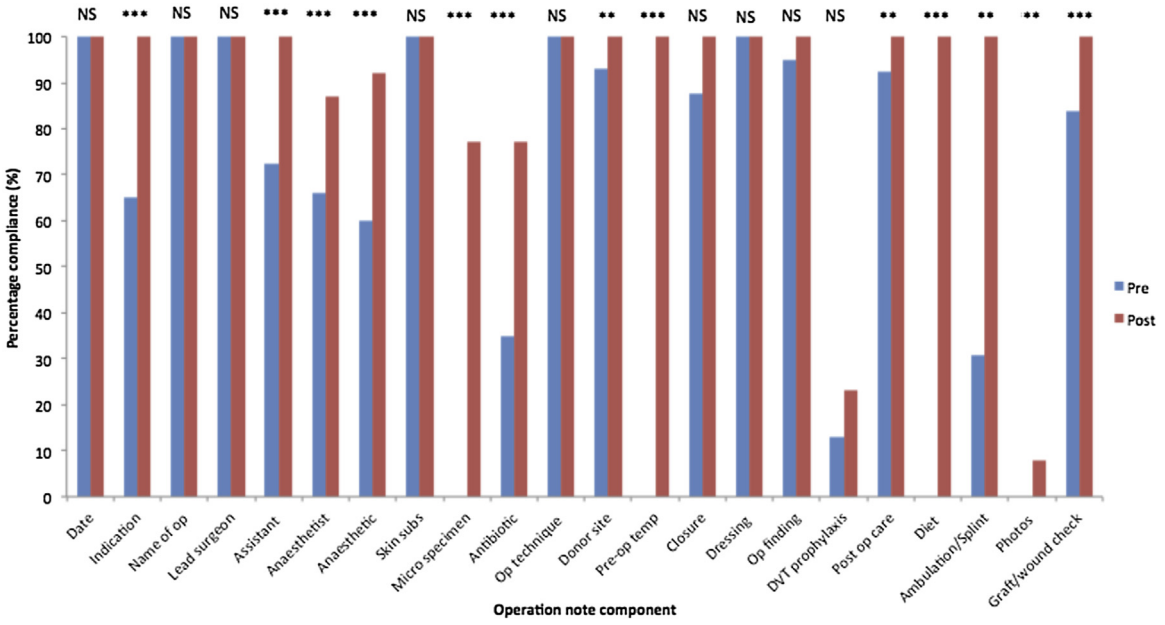

Fig. 1 – Percentage compliance for each operation note component pre and post-checklist implementation. Statistical significance denoted by: $^{**}p\leq0.01$, $^{***}p<0.001$.

implemented and no component scored 100%. Nevertheless, the benefits of electronic notes were further investigated in another orthopaedic study, which developed and implemented an electronic template based on existing software [9]. Following three PDSA (Plan-Do-Study-Act) cycles, with iterative adjustments, compliance improved significantly to 100%. The involvement of key stakeholders across hospital staff and consideration of user feedback was recognised as crucial to this success. To reflect this, we involved key stakeholders, including nursing and surgical staff, from the inception to implementation of our checklist. At inception stage, a draft of the checklist was designed based on GSP guidelines, tailored to burns surgery following review by senior burns consultants and residents at two separate UK Burn Centres. The draft was then reviewed by senior nurses and other allied healthcare professionals in the burns multidisciplinary team, including physiotherapists and dieticians. Stakeholder buy-in was further established by aligning the intervention to a key strategic priority for both the trust and the unit, i.e. to improve and implement patient safety measures. Following implementation, through staff education and presentations, we were then able to feedback guidance on practice and areas of improvement to stakeholders, another simple strategy shown to improve compliance [10].

In our study, four components (antibiotic, VTE prophylaxis, microbiology specimen, and clinical photography) scored less than 90%, but only VTE prophylaxis showed no statistically significant improvement after intervention. The General Medical Council (GMC) recommends documentation of all drugs prescribed in clinical records as per good medical practice [19]. *Good Surgical Practice* (2014) specifically highlights the importance of documenting antibiotic and VTE prophylaxis in an operation note, recognising two potentially major complications of surgery [7]. Documenting intraoperative antibiotic usage can reduce the risk of potential overdose and toxicity following repeat administration of antimicrobials post-operatively, such as gentamicin, which has a narrow therapeutic index [20]. Furthermore, with the rise in antibiotic resistance, associated with increased morbidity, mortality and hospital costs, documenting antibiotics will also enable monitoring of its usage [21]. Similarly, it is important to record and monitor VTE prophylaxis status, to evaluate its efficacy, with strong, consistent evidence lacking regarding its use in burns patients [22,23].

The documentation of whether microbiology specimen (including site) and clinical photographs were taken is particularly important for burns surgery. Microbiology cultures can identify the predominant bacterial species of the burn-wound, thus allowing targeted antibiotic use [24]. The International Society for Burn Injuries (ISBI) Practice Guidelines advocate such antibiotic stewardship for superior clinical outcomes, reduced antimicrobial resistance and costs [25–27]. Photographs are useful for medico-legal purposes, as well as conveying additional, visual detail [28]. Due to its accuracy and cost-effectiveness, photography is routinely used across the burned patient pathway, from assessing burn size and depth to evaluating post-operative outcomes and monitoring wound healing progression [29,30].

Potential reasons for inadequate recording of components include documentation elsewhere, such as in case notes, and not recording fields that were deemed non-applicable or negative for a particular case. This may explain why VTE prophylaxis did not significantly improve after intervention. Since many burns surgeries are day cases, its documentation for these may have been deemed unnecessary. However, we advocate that even negative fields should be documented. In the context of VTE prophylaxis, not documenting it may pose problems should a patient be admitted post-operatively and no VTE prophylaxis is prescribed or administered.

Few examples in the literature have demonstrated the use of a checklist in improving operation note quality. However, a study in total knee arthroplasty has shown it to significantly improve operation note quality when supplemented with surgeon education [31]. Checklists are effective because they are simple, cheap and easy to implement. The World Health Organisation (WHO) Surgical Safety checklist has shown that, on a larger scale, they can even translate into safer surgery and better outcomes [32,33]. Unfortunately, checklist usage does not ensure completion, as shown by the WHO checklist (used in 96.7% of operations, but only 62.1% were fully completed) [34]. In that case, the main barriers to full completion included resistance from staff, problems with its content and perception that it wasted time [35]. However, these can be overcome if checklists are designed with the involvement of multiple stakeholders. Particularly, cross-centre provider input can improve perceptions, and so compliance, beyond the local level. Since burns surgery is only practiced at specialist centres, this may be easier to achieve. Therefore, multicentre prospective studies are warranted to further develop and demonstrate generalisability of our proposed checklist.

Limitations of this study include that the initial evaluation against *Good Surgical Practice* standards was retrospective in nature and relied on case note review, which is limited by the quality of documentation. Moreover, whilst surrogate markers, such as antibiotic and VTE prophylaxis, were incorporated to prevent or minimise common complications, it is difficult to evaluate whether checklist implementation actually leads to superior patient outcomes. This, however, is an inherent limitation common to other studies aiming to improve operation note quality. Most importantly, though, the implementation, compliance and success of the checklist rely on the entire multidisciplinary team utilising it effectively, and so presents multiple levels at which it can fail. For it to be used successfully, it requires an administrator to print it out, a nurse to place it in the patient file and a surgeon to actually use it. Failure at any stage will result in the checklist failing without even being used. Moreover, a single centre study may limit the generalizability on the perceived effectiveness of the checklist at other centres, although input was received from a collaborator (SB) at another centre. Nevertheless, this is an inherent limitation with all single- institutional interventions and multicentre studies utilising the checklist are required to fully evaluate its effectiveness. Nonetheless, we believe the multidisciplinary involvement in the development of our checklist and utilising national guidelines (GSP), the checklist would be likely to improve operation note quality at burns centres nationally. A modified version can be adapted to any burns care facility worldwide to reflect local practice and standards.

Future work at our centre is focussing on integrating the checklist into an electronic format, with completion of all fields made mandatory for submission. We anticipate this will facilitate total adherence, improving the quality of operation notes to enhance post-operative intra and inter-team communication and patient care. We also aim to disseminate and implement the checklist at other UK burns unit to further evaluate its effectiveness.

5. Conclusion

The implementation of a burns surgery-specific checklist, modified from *Good Surgical Practice* (2014), presented a cheap and simple method for significantly improving overall operation note quality at our centre. To achieve total compliance, we have now implemented an electronic checklist with mandatory field completion. Future multicentre studies are required to enhance the checklist's generalizability.

Declarations of interest

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Conflicts of interest statement

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REFERENCES

[1] Association of Breast Surgery (ABS). Consensus guidelines on breast operation note documentation. London: ABS; 2014 Available from: https://associationofbreastsurgery.org.uk/media/1429/consensus-guidelines-on-breast-operation-note-documentation.pdf [Accessed 28 May 2018].
[2] Kennedy A, Oliver C. Record keeping. In: Colvin JR, Peden CJ, editors. Raising the standard: a compendium of audit recipes for continuous quality improvement in anaesthesia. 3rd ed. London: The Royal College of Anaesthetists; 2012. p. 122-3 Available from: https://www.rcoa.ac.uk/system/files/CSQ-ARB-2012_1.pdf [Accessed 28 May 2018].
[3] Guthrie B, Saultz JW, Freeman GK, Haggerty JL. Continuity of care matters. BMJ 2008;337:a867.
[4] Hjortdahl P, Borchgrevink CF. Continuity of care: influence of general practitioners' knowledge about their patients on use of resources in consultations. BMJ 1991;303:1181–4.
[5] Björkelund C, Maun A, Murante AM, Hoffman K, De Maeseneer J, Farkas-Pall Z. Impact of continuity on quality of primary care: from the perspective of citizens' preferences and multimorbidity — position paper of the European forum for primary care. Qual Prim Care 2013;21:193–204.
[6] Dukic I, Vissamsetti B, Payne S. Improving the quality of operation notes. BJU Int 2011;107:1546–8.
[7] The Royal College of Surgeons of England (RCS). Good surgical practice. London: RCS; 2014 Available from: https://www.rcseng.ac.uk/-/media/files/rcs/standards-and-research/gsp/gsp-2014-web.pdf [Accessed 28 May 2018].
[8] Severn Audit and Research Collaborative in Orthopaedics (SARCO). Assessing the quality of operation notes: a review of 92 operation notes in 9 UK hospitals. Patient Saf Surg 2016;10:5.
[9] Theivendran K, Hassan S, Clark DI. Improving the quality of operative notes by implementing a new electronic template for upper limb surgery at the Royal Derby hospital. BMJ Qual Improv Rep 20165: u208727.3498.
[10] Parwaiz H, Perera R, Creamer J, Macdonald H, Hunter I. Improving documentation in surgical operation notes. Br J Hosp Med 2017;78:104–7.
[11] Abbas SH, Singh S, Sundran R, Akbari K, Gilmour J, Puttick M. A thorough note: does a procedure-specific operation note proforma for laparoscopic appendicectomy improve compliance with the Royal College of Surgeons of England guidelines? Int J Surg 2016;2:1–5.
[12] Thomas AN, MacDonald JJ. Patient safety incidents associated with failures in communication reported from critical care units in the North West of England between 2009 and 2014. J Intensive Care Soc 2016;17:129–35.
[13] Pincock S. Poor communication lies at heart of NHS complaints, says ombudsman. BMJ 2004;328:10.
[14] Worster A, Haines T. Advanced statistics: understanding medical record review (MRR) studies. Acad Emerg Med 2004;11:187–92.
[15] Tingle JH. Nurses must improve their record keeping skills. Br J Nurs 1998;7:245.
[16] Lefter LP, Walker SR, Dewhurst F, Turner RW. An audit of operative notes: facts and ways to improve. ANZ J Surg 2008;78:800–2.
[17] Rogers A, Bunting M, Atherstone A. The quality of operative notes at a general surgery unit. S Afr Med J 2008;98:726–8.
[18] British Orthopaedic Association (BOA). Primary total hip replacement: a guide to good practice. London: BOA; 2012 Available from: https://www.britishhipsociety.com/uploaded/Blue%20Book%202012%20fsh%20nov%202012.pdf [Accessed 28 May 2018].
[19] General Medical Council (GMC). Good medical practice. London: GMC; 2013 Available from: https://www.gmc-uk.org/-/media/documents/Good_medical_practice___English_1215.pdf_51527435.pdf [Accessed 28 May 2018].
[20] Kovačević T, Avram S, Milaković D, Špirić N, Kovačević P. Therapeutic monitoring of amikacin and gentamicin in critically and noncritically ill patients. J Basic Clin Pharm 2016;7:65–9.
[21] Carmeli Y, Eliopoulos G, Mozaffari E, Samore M. Health and economic outcomes of vancomycin-resistant enterococci. Arch Intern Med 2002;162:2223–8.
[22] Rue 3rd LW, Cioffi Jr WG, Rush R, McManus WF, Pruitt Jr. BA. Thromboembolic complications in thermally injured patients. World J Surg 1992;16:1151–4.
[23] Sikora S, Papp A. Venous thromboembolism in burn patients is not prevented by chemoprophylaxis. Burns 2017;43:1330–4.
[24] McManus AT, Kim SH, McManus WF, Mason Jr AD, Pruitt Jr. BA. Comparison of quantitative microbiology and histopathology in divided burn-wound biopsy specimens. Arch Surg 1987;122:74–6.
[25] Davey P, Brown E, Charani E, Fenelon L, Gould IM, Holmes A, et al. Interventions to improve antibiotic prescribing practices for hospital inpatients. Cochrane Database Syst Rev 2013;4:CD003543.
[26] ISBI Practice Guidelines Committee. ISBI practice guidelines for burn care. Burns 2016;42:953–1021.

[27] Ogundipe KO, Adigun IA, Solagberu BA. Economic burden of drug use in patients with acute burns: experience in a developing country. J Trop Med 2009;2009:734712.
[28] Haywood RM, Heaton M, McCulloch TA, Sokal M, Perks AG. Operation notes illustrated with digital images. Sarcoma 2005;9:21–4.
[29] Saffle JR, Edelman L, Theurer L, Morris SE, Cochran A. Telemedicine evaluation of acute burns is accurate and cost-effective. J Trauma 2009;67:358–65.
[30] Thatcher JE, Squiers JJ, Kanick SC, King DR, Lu Y, Wang Y, et al. Imaging techniques for clinical burn assessment with a focus on multispectral imaging. Adv Wound Care (New Rochelle) 2016;5:360–78.
[31] Morgan D, Fisher N, Ahmad A, Alam F. Improving operation notes to meet british orthopaedic association guidelines. Ann R Coll Surg Engl 2009;91:217–9.
[32] Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med 2009;360:491–9.
[33] Weiser TG, Haynes AB, Dziekan G, Berry WR, Lipsitz SR, Gawande AA, et al. Effect of a 19-item surgical safety checklist during urgent operations in a global patient population. Ann Surg 2010;251:976–80.
[34] Mayer EK, Sevdalis N, Rout S, Caris J, Russ S, Mansell J, et al. Surgical checklist implementation project: the impact of variable WHO checklist compliance on risk-adjusted clinical outcomes after national implementation: a longitudinal study. Ann Surg 2016;263:58–63.
[35] Russ SJ, Sevdalis N, Moorthy K, Mayer EK, Rout S, Caris J, et al. A qualitative evaluation of the barriers and facilitators toward implementation of the WHO surgical safety checklist across hospitals in England: lessons from the surgical checklist implementation project. Ann Surg 2015;261:81–91.