

Institution: Imperial College London
Unit of Assessment: 01 Clinical Medicine
Title of case study: Making Surgery Safer: the WHO Surgical Safety Checklist
<p>1. Summary of the impact (indicative maximum 100 words)</p> <p>The World Health Organisation's (WHO) Surgical Safety Checklist is the culmination of over 5 years of concerted research effort to better understand, model and intervene in human factors that affect clinical performance and patient safety in operating theatres and surgical care. Imperial researchers were instrumental in the set up and implementation of the WHO 'Safe Surgery Saves Lives' working group, launched in 2006, from which the Checklist was a primary outcome. Subsequently, we were co-investigators, and UK-lead, in a global study the implementation of the Checklist in 8 pilot hospitals across 7 continents. The Checklist was demonstrated to significantly improve patient outcomes and was modified and mandated for use in all NHS surgical procedures in England by the National Patient Safety Agency. We have since lead a national study that evaluated the implementation of the Checklist within the NHS and successfully delivered a team training programme aimed at optimising use of the Checklist in our hospitals.</p>
<p>2. Underpinning research (indicative maximum 500 words)</p> <p>Key Imperial College London researchers: Professor Lord Ara Darzi, Professor of Surgery (1999-present) Professor Charles Vincent, Professor of Clinical Safety Research (2002-present) Dr Krishna Moorthy, Clinical Senior Lecturer in Upper Gastrointestinal (2007-present) Dr Nick Sevdalis, Senior Lecturer (2004-present)</p> <p>In the past 10 years, patient safety has become an international priority. Evidence shows that a significant proportion of errors and adverse events to patients occur in surgical care and, in response to this, surgical specialties are currently leading the research and clinical agenda on patient safety. In the UK, the publication of 'High Quality Care for All', government report led by Professor Darzi, (1) placed quality at the heart of NHS reforms and emphasised the critical role of clinical leadership in driving safety and quality improvement. This case study refers to our involvement in the development, validation and evaluation of the WHO Surgical Safety Checklist prior to its introduction to NHS surgical services in 2009.</p> <p>In 2002 the 'Clinical Safety Research Unit' was created within the Department of Surgery and Cancer at Imperial, which in 2007 transitioned into the significantly larger (in terms of income and FTE) 'Imperial Centre for Patient Safety and Service Quality' (www.cpssq.org), funded by the National Institute for Health Research (NIHR) – one of only two such centres in the UK. Co-led by Professors Darzi and Vincent, the Centre for Patient Safety provides an academic base and facilities for multidisciplinary research and innovations for safer healthcare. This research group is an international leader in assessing teamwork and leadership skills scientifically, using extensively validated metrics, which allow the measurement of these behaviours to be linked to clinical processes and patient outcomes. Our research group has been at the forefront of international safety-related research in surgery, with numerous evidence-based outputs on assessing human behaviour and team skills in the operating theatre, the surgical environment as a contributor to error, as well as developing and thoroughly validating interventions that we have shown enhance surgeons' performance and the safety of surgical procedures. We have pioneered surgical safety interventions, including team assessment and training, drawing extensively on similar applications in high risk industries such as aviation (2, 3).</p> <p>Based on our track record on surgical safety research, members of our Department (Dr Moorthy, Professor Darzi) formed part of the WHO's 'Safe Surgery Saves Lives' working group, which formed in 2006 and produced the WHO Checklist and its study as its main output (4). Professor Darzi also chaired a surgery sub-theme to identify the evidence based indicators, which was</p>

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included in the final checklist.

St Mary's, one of the Imperial NHS Trust hospitals where we are based, was subsequently selected in 2007 as the lead for the UK for the international pilot evaluation of the WHO Checklist 5), which was carried out across eight countries. This pilot study demonstrated significant improvements in patient outcomes following Checklist implementation worldwide – including reduction in patient mortality following major operations from 1.5% to 0.8% and reduction of inpatient complications from 11% to 7% (6).

3. References to the research (indicative maximum of six references)

- (1) Darzi A. *High quality care for all. NHS next stage review final report*. Department of Health, 2008. Available at: <https://workspace.imperial.ac.uk/ref/Public/UoA%2001%20-%20Clinical%20Medicine/High%20quality%20of%20all.pdf>
- (2) Moorthy, K., Munz, Y., Forrest, D., Pandey, V., Undre, S., Vincent, C., Darzi, A. (2006). Surgical crisis management skills training and assessment: A stimulation-based approach to enhancing operating room performance. *Annals of Surgery*, 244, 139-147. [DOI](#). Times cited: 58 (as at 6th November 2013 from ISI Web of Science). Journal Impact Factor: 6.32.
- (3) Sevdalis, N., Lyons, M., Healey, A.N., Undre, S., Darzi, A., Vincent, C.A. (2009). Observational teamwork assessment for surgery: construct validation with expert versus novice raters. *Ann Surg*, 249 (6), 1047-1051. [DOI](#).
- (4) World Health Organisation. *Safe Surgery Saves Lives campaign*. Available at: <http://www.who.int/patientsafety/safesurgery/en/>. [Archived](#) on 6th November 2013.
- (5) Vats, A., Vincent, C., Nagpal, K., Davies, R.W., Darzi, A., Moorthy, K. (2010). Practical challenges of introducing WHO surgical checklist: UK pilot experience. *British Medical Journal*, 340, b5433. [DOI](#). Times cited: 40 (as at 6th November 2013 from ISI Web of Science). Journal Impact Factor: 17.21.
- (6) Haynes, A.B., Weiser, T.G., Berry, W.R., Lipsitz, S.R., Breizat, A.H.S., Dellinger, E.P., Herbosa, T., Joseph, S., Kibatala, P.L., Lapitan, M.C.M., Merry, A.F., Moorthy, K., Reznick, R.K., Taylor, B., Gawande, A.A. (2009). A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population. *New England Journal of Medicine*, 360, 491-499. [DOI](#). Times cited: 814 (as at 6th November 2013 from ISI Web of Science). Journal Impact Factor: 51.65.

Key funding:

- NIHR (2007-2012; £4.5million), Principal Investigators (PIs) A. Darzi and C. Vincent, Imperial Centre for Patient Safety and Service Quality.
- NIHR (2009-2011; £847,368), PI A. Darzi, Surgical safety: National quality improvement initiative.
- NIHR (2012-2017; £7.2million), PIs A. Darzi and C. Vincent, Imperial Patient Safety Translational Research Centre.

4. Details of the impact (indicative maximum 750 words)

Impacts include: health and welfare, practitioners and services

Main beneficiaries include: patients, health professionals, NHS, international healthcare providers, WHO, hospital trusts and providers

The WHO Checklist is the single most widely utilised and known patient safety intervention to be deployed within surgical care since patient safety became an international priority a decade ago. Following the findings of the first global health study of the implementation of the WHO surgical safety checklist, the NHS National Patient Safety Agency (NPSA) mandated a modified version of the WHO Checklist for use in all surgical procedures in England, including day surgery in January 2009 [1]. The Checklist is now part of standard and mandatory operating theatre procedures in this

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country. Its direct impact on patient care is enormous: it reaches 4.6 million surgical patients undergoing an operation annually in England alone [2]. Further, there are an estimated 234.2 million surgical patients worldwide [3], many of whom are positively affected by the Checklist which as of March 2013 is actively used in 1790 healthcare organisations worldwide [4].

To promote the Checklist across the NHS, the NPSA launched a major implementation campaign known as 'Patient Safety First' [5] to improve the safety of patients in the NHS. In 2009, our research group undertook the national 'Surgical Checklist Implementation Project' (SCIP [6]). Funded by the NIHR and led jointly by Professors Darzi (surgery) and Vincent (safety), this project brought together surgeons and psychologists aiming to scientifically study the implementation process of the Checklist across the NHS, understand its impact on healthcare providers' use of the Checklist, and derive lessons for the future.

SCIP involved longitudinal data collection over 18 months (2010-11) across 19 hospitals in England (stratified for location, size, and teaching vs. community status), surveying more than 3000 NHS personnel, including observations of over 500 full surgical procedures, and collecting outcome data from more than 6500 patients [6]. The project data is currently being prepared for dissemination. The following findings have emerged:

- Attitudes towards the Checklist in English hospitals have steadily improved over time. By the study end (Sept 2011), 74% of operating theatre staff said they wanted to use the Checklist, 72% believed that the Checklist makes surgical care safer, and 67% believed that it improves information transfer in operating theatres.
- The Checklist was used in over 96% of operations. When the Checklist was not used (particularly its final 'Sign-out' part, at the end of a procedure) there was a trend for increased post-operative complications.
- Teamwork and compliance with standard processes of care (including antibiotic prophylaxis and patient warming) are significantly higher in teams who apply the Checklist fully (i.e., all items), who have all team members present for the Checklist, where all team members pause and, finally, where surgeons lead the Checklist application.
- A systematic review we carried out as part of SCIP has provided evidence that use of the Checklist improves teamwork and communication in the operating theatre when used appropriately without team resistance [7].

Following SCIP, Imperial Healthcare NHS Trust launched a one-year (2011-12) surgical team training project, led by our research group and aimed to improve use of the WHO Checklist across our Trust's three hospitals. The project culminated in modifications to the Checklist (which were encouraged by its original developers) proposed and led by our Trust's personnel – the modified Checklist was rolled out to the entire Trust's surgical services in 2013. Further, local 'champions' of surgical safety have been appointed and regular Checklist audits are now in place.

Our group's research on team working and safety in surgery has been highlighted twice as research with significant societal impact in the UK by the Economic and Social Research Council (ESRC). In 2009, our research on simulation-based training for surgeons, which incorporates training in the use of the checklist, was selected as an impact case study in the ESRC's 2009-14 Strategic Plan [8]. In 2011, our research on assessing team working skills in operating theatres was selected as a case study for societal impact that highlights the 'human element of surgery'.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[1] National Patient Safety Agency. WHO Surgical Safety Checklist. Patient Safety Alert PSA002/U1. 2009: <http://www.nrls.npsa.nhs.uk/alerts/?entryid45=59860>. Archived on 6th November 2013.

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- [2] Royal College of Surgeons of England. Surgery and the NHS in numbers. Available at: www.rcseng.ac.uk/media/media-background-briefings-and-statistics/surgery-and-the-nhs-in-numbers. Archived on 6th November 2013.
- [3] Weiser, T.G., Regenbogen, S.E., Thompson, K.D., Haynes, A.B., Lipsitz, S.R., Berry, W.R., Gawande, A.A. (2008). An estimation of the global volume of surgery: a modelling strategy based on available data. *Lancet*, 372 (9633), 139-144. DOI.
- [4] WHO Patient Safety. Surgical safety web map: <http://maps.cga.harvard.edu:8080/Hospital/>. Archived on 6th November 2013.
- [5] NPSA campaign: www.patientsafetyfirst.nhs.uk. Archived on 6th November 2013.
- [6] SCIP project: www1.imperial.ac.uk/medicine/about/institutes/patientsafety/servicequality/research_themes_2/c_pssq_research_themes/surgical_checklist/. Archived on 6th November 2013.
- [7] Russ, S., Rout, S., Sevdalis, N., Moorthy, K., Darzi, A., Vincent, C. (2013). Do safety checklists improve teamwork and communication in the operating room? A systematic review. *Annals of Surgery*, DOI.