

# Original papers

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## Making Surgical Care Safer : A Survey on the Implementation of the Checklist by Belgian Surgeons

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**Abstract.** *Background* : The operating theatre (OT) is a complex environment. The purpose of this survey was to evaluate the implementation of the surgical checklist (SC) at individual level by Belgian Surgeons.

*Methods* : A Surgical Checklist Questionnaire (SCQ) related to the use of the SC by individual surgeons was attached to the registration website for the 2015 Belgian Surgical Week. It was a one page long, user friendly document, easy to be filled voluntarily and anonymously.

*Results* : Among the 206 surgeons who registered, 81 (39%) filled in the SCQ. The SC template proposed by the WHO "Safe Surgery Saves Lives" initiative was used by 91% of the respondents. However, 89% adapted the SC to their local hospital environment, and 87.5% use it personally for their patients. Since implementation, the SC was never adapted in 46%. According to 21% of respondents, an adverse event was avoided thanks to the SC. Amazingly, SC was considered as an administrative burden by 83% despite the same percentage recognized that patients benefited from the SC. Only 28% of respondents got feedback from the use of the SC.

*Conclusions* : In this survey, the number of adverse event avoided thanks to the use of the SC demonstrates that SC represents a simple strategy for addressing surgical patient safety in OT. Nevertheless, SC is still considered by many surgeons as an additional administrative burden and/or as just another gimmick. Further studies are needed to understand why some surgeons are still not willing to adapt to a changing safety culture.

### Introduction

Generally the knowledge does exist, but however specialized and well trained surgeons may have become, steps are still missed and mistakes are still made in the Operating Theatre (OT).

In a more and more complex environment such as the OT, five main challenges – related at the same time to the *human factors* and to the *system factors* – have to be proactively faced by surgeons and all the actors casted for the surgical stage (1) :

1. The *fallibility* of human memory and attention, especially when it comes to routine matters that are easily overlooked under the strain of more pressing events.
2. The insidious risk that surgeon and/or OT team's members can lull themselves into skipping several steps even when they remember them (because, after all, those steps don't always matter). "This has never been a problem before", people will then say. Until one day, it is a problem !
3. The *incompetence* of OT actors defined as an inability or unwillingness to practice within the standards of care prescribed by the scientific and professional societies in general or by leaders for their department members in particular.
4. The *impairment* of OT actors defined as a diminished ability (often transient) to provide the requisite stan-

dard of care owing to a physical and mental disturbance, or to substance misuse of any kind.

5. The biggest challenge of 21<sup>st</sup> century surgery is, however, the *ability to function in systems-based care* rendered by effective teams, whose members have the interpersonal skills to communicate. Why ? Because poor care is inevitable when a complicated patient is cared for by myriad individuals who have not been trained to communicate effectively as a team.

The surgical checklist approach can be one of the simple tools for the systematic early identification and reporting of such challenges. We, here, report the current Belgian Surgical experience with the implementation of this easy-to-use strategy for addressing those five challenges. Data were obtained from a survey conducted for the 16<sup>th</sup> Belgian Surgical Week, whose main theme "Volume and Quality in Surgical Outcome" was masterminded in 2015 by the Department of Surgery of Ghent University.

### Material and Method

#### *Surgical Checklist Questionnaire (SCQ)*

A straightforward questionnaire related to the use of the Surgical Checklist by Belgian surgeons was attached to the registration website for the 2015 Belgian Surgical Week. It was a electronic one page long (A4) user friendly

document, easy to be filled in on line, in order - hopefully - to get a good compliance from fellow surgeons.

The Surgical Checklist Questionnaire was designed by the first author and submitted to the board's members of the Royal Belgian Society of Surgery (RBSS) for suggestions and criticisms. The final version is presented in Table 1.

#### *Avoidance of conflict of interest and Hawthorne Effect*

In the wake of the 2009-World Health Organisation (WHO) "Safe Surgery Saves Lives" initiative (2), the Belgian Federal Ministry of Public Health made a two days survey in 2012 about the use of the Surgical checklist in Belgian Hospitals. The results were rather promising in terms of implementation and use of surgical checklist in OTs. However, the vast majority of data was introduced, not directly by surgeons and/or anesthesiologists, but by representatives of hospital quality groups. This introduced a bias inasmuch as the first line actors (and full responsible) – the surgeons and anesthetists – were not the leading recorders of data. Therefore, the current survey is purposely a grassroots analysis organized by the scientific body of the Belgian surgical community (ie. the RBSS) among active surgeons on a volunteer basis, and not a survey orchestrated by official power structures.

In fact, the quality groups of all participating hospitals to the survey of the Federal Ministry of Public Health could be faced, somehow, to some kind of conflict of interest. A conflict of interest being a set of circumstances that creates a risk that professional judgement or actions regarding a primary interest will be unduly influenced by a secondary interest.

*Primary interest* refers to the principal goals of the profession or activity, such as the protection of patients, the integrity of research, and the duties of public office.

*Secondary interest* includes not only financial gain but also such motives as the desire for institution promotion and professional advancement and the wish to do favours to his own department and/or hospital.

The secondary interests are not treated as wrong in themselves, but become objectionable when they are believed to have greater weight than the primary interests. The *conflict* in a conflict of interest exists whether or not a particular individual is actually influenced by the secondary interest. It exists if the circumstances are reasonably believed (on the basis of past experience and objective evidence) to create a risk that decisions may be unduly influenced by secondary interests. This risk is exemplified by the *Hawthorne Effect*, which is the modification in the behavior of subjects that results from their knowing that they are under observation as part of a research study or administrative survey. To avoid the bias of the Hawthorne Effect, the surgeon was asked to follow

a link to the short electronic survey in order to share his or her professional implementation of the surgical checklist in his or her OT. All the answers and data were kept anonymous.

#### *Correlation – Surface of things – Anonymised data*

As every active surgeon knows, a statistical correlation does not necessarily mean a cause-effect relationship. This is the reason why, the RBSS survey was focused directly on the surgeons in order to record the actual use of the surgical checklist in Belgian OT, bypassing any other hospital quality group or administrative body. In this sense the number of responses to the survey (ie. the number of questionnaire filled in) was expected to be a major indication of surgeons' compliance with what appears for many of them as being another useless coercive measure. Thenceforth, there was also a psychological aspect to the RBSS survey well in line with the pitfalls related to the "respondent conditioning", discovered by Ivan Pavlov through his famous experiments with dogs : "While you are experimenting, do not remain content with the surface of things."

How often the surgical checklist was considered as a coercive measure and how often as an incentive measure "consensus based" for the individual surgeon would actually not reflect *the surface of things*, but well the tendency - or not - to get used to work side by side with sources of errors, or even to tolerate them, which is called : the normalization of deviance.

The survey questionnaire attached to the Surgical Week registration website could be filled in – or not – at the discretion of every surgeon. All responses were anonymously collected. The data bank was secured in order to prevent any tracking of the respondent or respondent's hospital by the survey creators (3, 4).

## Results

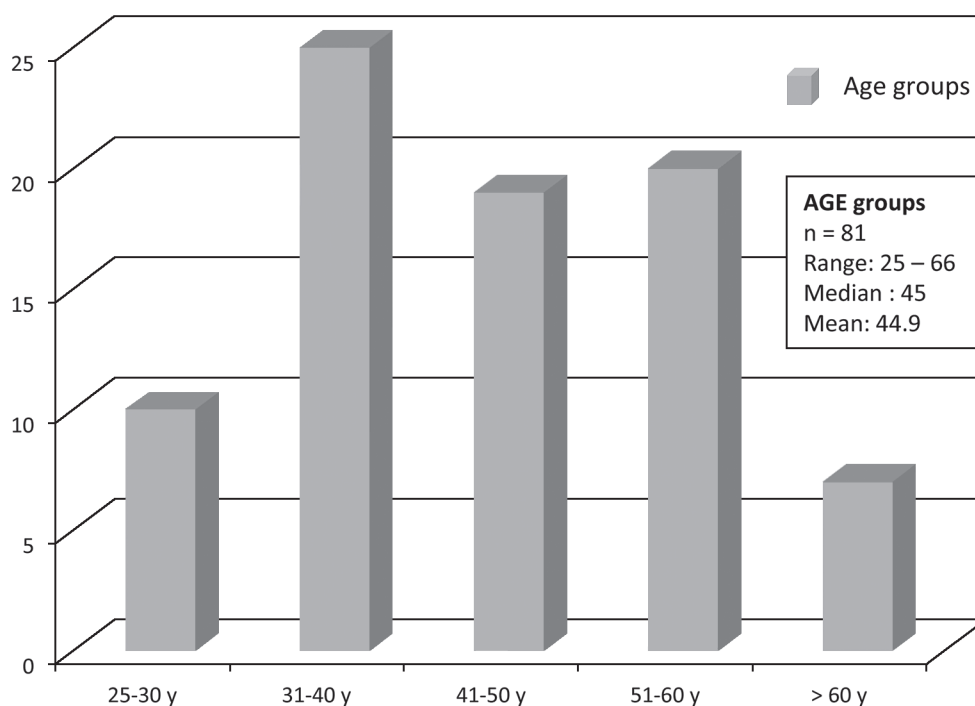
**Questions 1 & 2.** Among the 206 surgeons who registered for the 16<sup>th</sup> Belgian Surgical Week, 81 (39%) filled in the SCQ. Sex ratio (F/M) was 22/59. The distribution according to age is shown on Figure 1. The younger and the oldest surgeons represent the lower group of respondents. The percentage of respondents according to their surgical specialty (one or more) is detailed in Figure 2.

**Question 3.** The Surgical Checklist (SC) template as proposed in 2009 by the World Health Organisation (WHO) "Safe Surgery Saves Lives" initiative is used by 91% of the participants to this RBSS survey (but 89% will adapt the SC ; see question 6).

Some strong negative but very pertinent statements are sometimes joined to the answers to the third question, such as «It is sad to see the checklists and protocols being imposed where doctors should be intelligent people.

**Table 1.** Survey of the RBSS about the use of the Surgical Checklist.

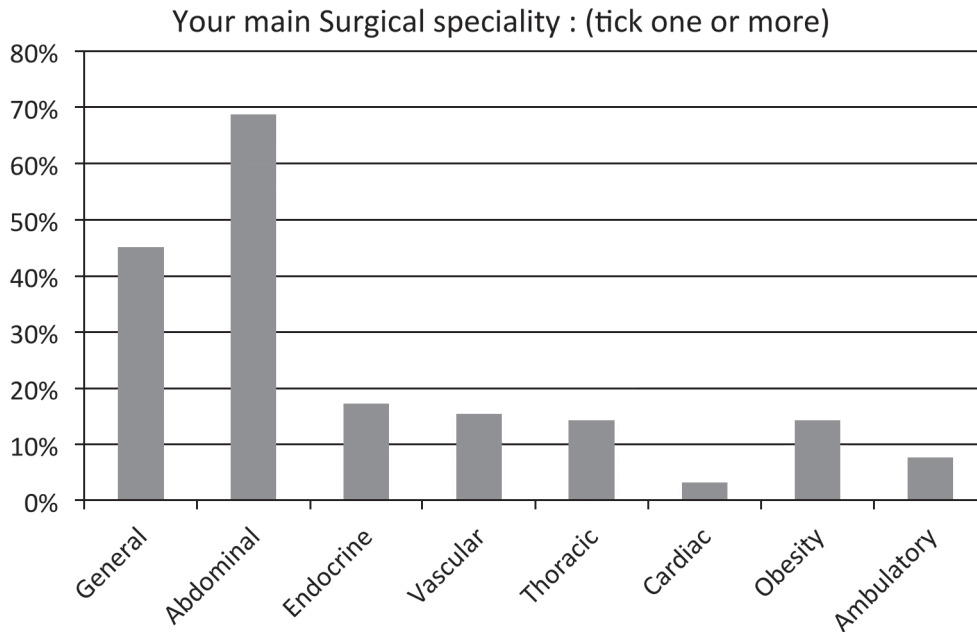
The questions are directly related to your <b>personal</b> implementation of the Surgical Checklist (SC) in the Operating Theatre (OT). The answers and data will be kept anonymous.
1. Your age and sex.
2. Your main surgical specialty: general, abdominal, endocrine, vascular, thoracic, cardiac, obesity, ambulatory, other... (tick one or more)
3. Does your service use a SC as proposed by the World Health Organisation (WHO) ?
4. If YES, do you use personally the SC for your own patients ?
5. Is the SC part of the surgical patient's chart ?
6. Has your SC been adapted to your local environment or is it just a copy of the WHO template ?
7. Where is the SC form stored after the surgical operation (patient's chart or in another administrative record) ?
8. Do you use a paper SC or an electronic SC ?
9. Do you regularly adapt the SC (annually, or more or less frequently) after discussion with your colleagues and the members of the OT staff ?
10. Do you remember a recent adverse event that has been avoided thanks to the use of the SC ?
11. Which type of adverse event ?
12. Do you consider the use of a SC as an additional administrative burden for the OT staff ?
13. If YES, WHY ?
14. In the Operating Room, who is actually checking the boxes and completing the SC form (surgeon, nurse, anesthesiologist, other...) ?
15. Which percentage of your patients is benefiting from the use of the SC ?
16. Did you already get any feedback from the use of the SC in your OT ?

**Figure 1.** RBSS 2015 - Survey about the use of the Surgical Checklist.

*Lack of thinking and professionalism cannot be cured with extra protocols [...] The managerial hype is so strong, that non believers are inquisitionized. [...] I believe in personal earnest professional thinking, rather than clicking "x" on a computer screen. The problem is really that the clicking is done brainlessly. If people would think and click, I would see some good in it, but all the "accreditation-winning" extra administration and*

*clicking demonstrates the exact opposite.»* These respondents should be warmly thanked for their effort to convey a rational and reasonable comment, which – by the way – reinforces the pertinence of the grassroots approach chosen by the RBSS to survey the SC issue by an anonymous SCQ directly focused on fellow surgeons.

**Question 4.** About the individual use of the SC, 87.5% of respondents use personally the SC for their own



**Figure 2.** Your main Surgical specialty : (tick one or more).

patients. However, six surgeons (7.5%) skipped this question.

**Question 5.** For 88% the SC is part of the surgical patient's chart. Once again, four surgeons (5%) skipped this question.

**Question 6.** The majority of respondents (89%) are using a WHO-SC adapted to their local hospital environment ; 11% are using just a copy of the WHO template ; six (7.5%) skipped the question. Actually, the WHO allows modification of the its template to improve the checklist's fit with local workflow and environment.

**Question 7.** After the operation, the SC form is stored in the patient's chart for 72% of responders ; for 28% in another administrative record.

**Question 8.** The SC is a paper one in 61% and electronic in 39% ; question skipped by four surgeons (5%).

**Question 9.** Since implementation, the SC has never been adapted in 46% ; annually adapted in 20% ; more or less frequently in 34%. Eight responders (10%) skipped the question.

**Questions 10 & 11.** According to 21% of respondents a recent adverse event was avoided thanks to the use of the SC. Of course, the types of adverse events are worth considering from a practical viewpoint and in terms of OT safety.

Indeed, eight surgeons reported either the confusion of patients (5 cases) or the confusion of side (3 cases). Eight other surgeons reported wrong positioning of the patient on the operating table in one ; missing material and disposable device in two ; wrong name on biopsy specimen in one ; no blood available although there was bloodloss expected in one pediatric operation, wrong towel count in

one ; wrong bariatric operation in one, and skipped antibiotics allergy in one patient.

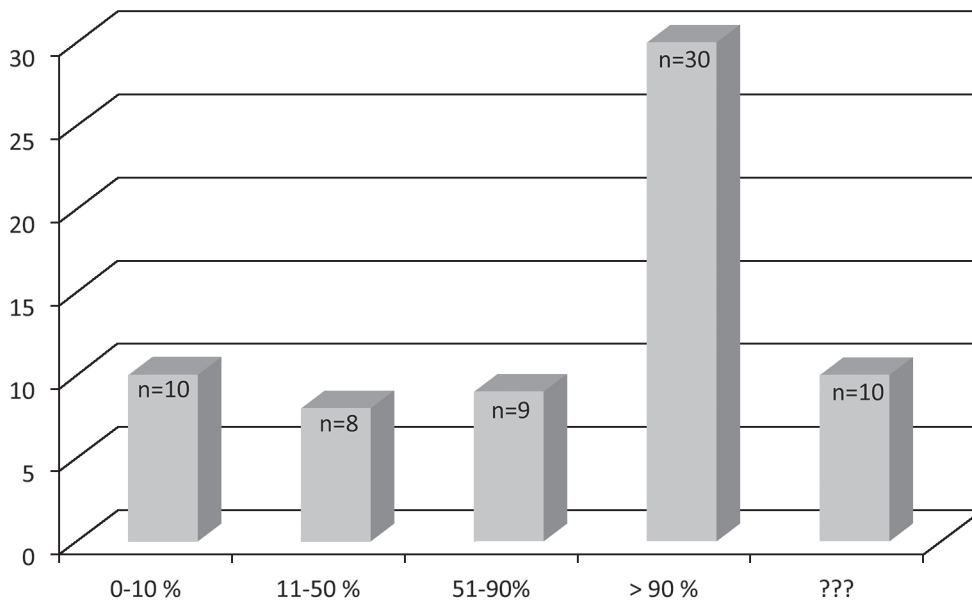
**Questions 12 & 13.** The SC is considered as an additional administrative burden for the OT staff by 83% of the respondents. When asked why, the responders are rather severe in their comments : «A short SC is sufficient for safety, longer SC is more time-consuming.» Which is perfectly right : a well adapted checklist must be simple, effective and quick to ensure the trivial and rather stupid, but critical, stuff is not overlooked.

Other respondents mention that «SC is a burden but useful [...] that it increases administrative load [...] that it is useless in a well running OT. If the OT runs well all potential mishaps should be recognized long before the mistake is made.»

This last statement is a rather optimistic one, because what is precisely an OT that is running well ? Is it an OT where people may say "This has never been a problem before", until one day it is a problem !

**Question 14.** In the operating room, the nurses are checking the SC boxes and completing the SC form in 69% of the cases ; surgeons in 19% and anesthesiologists in 12%. These numbers are somewhat puzzling when one goes through the 21 individual comments made about this question 14. In fact, for the 21 surgeons, the ideal situation should be the nurse, surgeon and anesthesiologists running together verbally through all the items of the SC.

**Question 15.** Regarding the percentage of patients benefiting from the use of the SC, 14 surgeons skipped the question (17%), nevertheless 67 (83%) acknowledged some kind of benefit for the patients. The highest



**Figure 3.** Percentage of patients who benefited from the surgical checklist according to 67 surgeons (10 acknowledge some benefit but did not give percentage).

percentage of benefit (above 90%) was recognized by 30 surgeons out of 67, and the lowest percentage (below 50%) by 18 surgeons (Fig. 3). Ten respondents did not give any percentage.

**Questions 16.** Some kind of feedback from the use of the SC in their OT has been obtained by only 28% of respondents. Sixteen of them gave comments about the kind of feedback.

Some comments were positive : «*Figures on compliance ; errors avoided (material and patients) ; debriefing with “quality” coordinator ; completion rate is an issue ; missing data for emergency surgery ; only 50% of SC are done properly ; I am convinced of the utility and I participated to its elaboration in my hospital but I am the only surgeon of the hospital to use the SC for 100% of my patients. I have the impression to be a bloody nuisance rather than somebody who worries about quality.*»

Some comments were frankly negative : «*Ridiculous aspect of the SC ; administrative paper work filled in and checked by quality coordinator or security manager often afterwards ; many colleagues, nurses and anesthesiologists do not believe in it ; some consider it useless and ridiculous.*»

## Discussion

In marketing language, a **gimmick** is a unique or quirky special feature that makes something “stand out” from its contemporaries. Thus, a gimmick is a special feature for the sake of having a special feature. For some surgeons, transferring the concept of checklist from aviation to surgery sounds intuitively sensible. However, for many

surgeons to claim that the use of checklists can reduce the rates of inpatient complications, including death by more than 30%, based on extrapolation across a mixture of hospitals in developed and developing countries, may be misleading and counterproductive (2).

In fact, the concept of checklist, which has widely demonstrated its efficiency and effectiveness in aviation industry, is a reasonable and simple step to promote greater team cooperation in OT, and most likely too in other hospital’s departments (5). To focus the benefit of checklist on reduction in the perioperative rate of death may, therefore, adversely affect credibility of the concept but above all the compliance of first line actors in the OT with this potentially valuable adjunct to safety measures for surgical patients (3).

The *Hawthorne Effect*, which is the modification in the behavior of subjects that results from their knowing that they are under observation as part of a research study or administrative survey, is another strong point against the results of studies inferring that the use of checklists is effective. We mentioned in the Method section of the current study that, in order to avoid the bias of the Hawthorne Effect, the surgeons were asked to follow a link to the short electronic survey in order to share his or her professional implementation of the surgical checklist in his or her OT. All the answers and data were kept anonymous. Therefore, consideration of the possible effects of direct observation in the operating room, as well as other artifacts of the research process have been discarded. Responding surgeons were fully aware that they were anonymous participants in a survey of their own behavior. The frank and temperamental aspects of the comments

added by several surgeons to their answers demonstrate the extent to which they were freed from all suspicion about the aim of the survey. Thus, the record of the actual individual practice of participating surgeons was not at all altered or biased by the research context.

Compared with our survey, the Belgian Federal Ministry of Public Health that made a two days survey in 2012 about the use of the Surgical checklist in Belgian Hospitals had a poor preintervention-postintervention design open to severe criticism. BLINDING (4, 6) should have been used to reduce performance biases such as the well-known *Hawthorne Effect*. Clinicians could have been kept unaware of the study, and the checklist could have been introduced as a matter of hospital policy in precisely the ways intended for subsequent routine use (7). In this aspect, it is likely that hospitals' quality groups did an arguable job because the opportunity to reliably estimate the size of the effects of checklist introduction in a trial has been missed. Falling in the Hawthorne trap is counterproductive. In fact, what surgeons really need is a sophisticated and long overdue study (8) of the Hawthorne effect on the behavior of the OT personnel. Observation of OT actors may play a role in the results by impacting on the cause-and-effect relationship between the checklist program and the observed reduction in complications. Observation could have produced the Hawthorne effect by three possible mechanisms. First, the presence of an observer may have affected outcomes. Second, teams may have used the checklist more assiduously because of the ongoing study, but this would not weaken any checklist effect. Finally, there is the possibility that the performance of the operative teams improved because of their awareness of being studied.

Another objection often raised against the checklist concept is the length of the checklist ; it is particularly unclear why a "time out" break should be conducted after the induction of anesthesia, rather than immediately before the induction of anesthesia. The statement that the intervention is neither "costly nor lengthy" is not supported in several studies. Actually, the local checklist should be adapted to the local environment and to the type of surgery ; the checklist should also be designed to be brief ; the total duration should be less than two minutes in routine situations. The checklist has to be kept short by focusing on what is called "*the killer items*" : the steps that are most dangerous to skip and sometimes overlooked nonetheless.

The types of adverse events highlighted in the current survey are worrying but rather typical of what can happen in any OT with overlooked killer items. In fact, those adverse events reflect precisely what the WHO Guidelines for Safe Surgery were aiming at. The guidelines were published following a systematic review of the evidence available, with formal recommendations linked to the strength of evidence. Ten essential objectives for

safe surgery were identified that were applicable in all WHO member states ; these related to : (i) correct site surgery, (ii) provision of safe anaesthesia, (iii) management of airway problems, (iv) management of haemorrhage, (v) avoiding known allergies, (vi) minimizing the risk of surgical site infection, (vii) preventing the retention of swabs and instruments, (viii) accurate identification of specimens, (ix) effective communication within the surgical team and (x) routine surveillance of surgical outcomes. The WHO Surgical Safety Checklist was formulated in order to disseminate these simple recommendations. However, the final stage of any guideline development is to test the guideline. This is exactly what our survey did at the level of the surgical Belgian community by addressing the anonymous questionnaire directly to the first line surgeons. By doing so, we could investigate the surgical system close to the battle field, or even better close to the mind of the soldiers. However, the results are still unclear concerning the identification of the cause and types of resistance to basic safety attitudes.

The Surgical Safety Checklist has been initially designed for routine use in OT as a standard operating procedure. This begs the question of what should be done in a crisis situation (9) ? The Harvard School of Public Health (10) has recently developed a number of checklists to be used during commonly encountered emergencies in OT. Twelve 'crisis checklists' were developed after an appraisal of evidence and according to best practice. Teams were tested in the simulator and were randomly assigned to use the crisis checklist or to deal with simulated emergencies (such as hypotension or bronchospasm) according to memory. The use of the crisis checklist was associated with a six-fold reduction in failure to adhere to critical steps in the management of the emergency, providing a suggestion that, just as in the airline industry, checklists may help avoid missing crucial steps in highly pressurized situations (11).

Surgeons must also acknowledge that anesthesiologists are used, much better than them, to checklists in OT, the best known being the anaesthetic machine checklist. Safety checklists are available also for multiple situations, on the ward, in the ICU, in the OT, at the bedside with the good old TPR chart recording temperature, pulse and respiration. While seemingly simplistic, the evidence supports the fact that patients benefit from well-designed checklists when they are used effectively. Effective implementation requires training, coaching, communication, and a *change in safety culture*, with routine measurement and regular feedback of outcomes. In the cockpit, the pilot and the co-pilot are changing ; it is the same in the OT given that team composition is not always consistent from day to another or even worse from one operation to another. Furthermore, team members involved in a surgical operation may speak up whenever necessary for safety reason. As far as safety is concerned

no cultural and hierarchical aspects can prevent the right of speak up from being taken.

For those who find the culture of using checklists difficult, the barriers are not the time taken, or that the checks are unnecessary, but lie within ourselves and our ability as clinicians to adapt our safety culture to perform checks in a prescribed manner (9). When we catch a plane, none of us object to our passport being checked and we expect that routine safety procedures will always be followed. Our patients should be guaranteed the same. However, there are differences between a surgeon and a pilot : the passenger may choose his surgeon but not the pilot of the plane ; the surgeon will have to live with the remembrance of an individual human disaster, the pilot will most likely be killed in the crash.

This last reference to the airplane metaphor in the OT leads us, last but not least, to what a surgeon (12) astutely pointed out regarding the lessons from aviation that can be directly applied to improve safety in OT. Before attending medical school, he was a fighter pilot. For him the design of the WHO checklist was informed by experience from aviation and other industries, and the use of checklists enhances both patient safety and clinical professionalism. This surgeon gives us a lesson that can serve as an excellent conclusion, as it sounds like Immanuel Kant's categorical imperatives :

*«Many years ago, before attending medical school, I was a fighter pilot flying F-86 Sabrejets in the US Air Force. I and most of my flying colleagues always used checklists that were strapped to our thighs while we were sitting in the cockpit. Every one of the myriad switches, gauges, dials, handles, and circuit breakers had to be properly set or checked. Procedures had to be followed assiduously, especially during an emergency. Checklists helped us do that. Each of us knew that a careless mistake could lead to our death. By contrast, if physicians or nurses make a careless mistake, someone else suffers or dies. Many of us evince too cavalier an attitude in working with patients. If all of us in medicine thought our own lives were at risk, you can bet a lot fewer mistakes would be made. Requiring the use of checklists is an excellent way to reduce errors and keep our patients safer.»*

In other words : effective implementation of checklists requires individual clinicians to adapt to a changing safety culture and to comply with the basics of medical ethics.

In 2015, there will always remain surgeons with negative clinical attitudes and lack of buy-in or engagement. Those surgeons are forming the last square (hollow box-formation) resisting changes. Forming square in 1815, on one of the many battle fields in Belgium – Waterloo –, was a successful manoeuvre for Wellington to resist the French cavalry attack around 16:00 pm on July 18. As dusk fell, the last two battalions of the Old Imperial

Guard of Napoleon formed four last squares around the farm “La Belle Alliance” to resist British and Prussian armies. But it was too late ; they could hardly protect the retreat of Napoleon. The last square of surgeons, irreducible to simple way to enhance patient's safety, may not be convinced by lessons of History. Hopefully, a quantitative formulation of Kant's categorical imperative would make a better job : in one survey, there was an improvement in safety attitudes as measured by a modified Safety Attitudes Questionnaire (13) that correlated with the reduction in postoperative complication rate. Of those questioned, 93% said that they would want the surgical checklist used if they were having an operation... full stop !

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