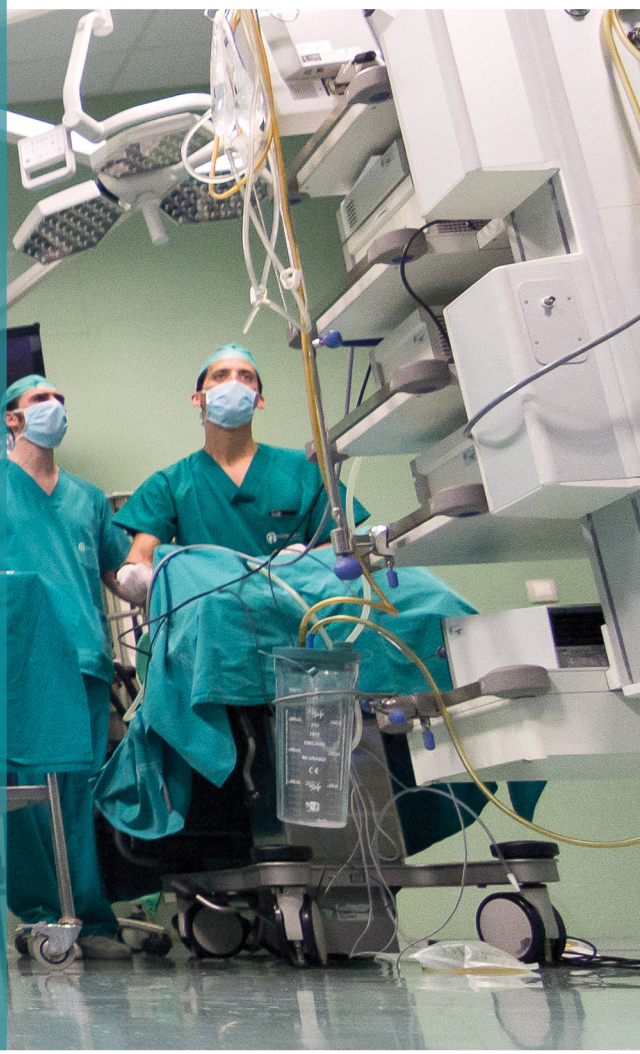
HANDBOOK OF SOFT SKILLS TRAINING USING VIRTUAL REALITY AND SERIOUS GAMES FOR SURGICAL TEAMS IN THE OPERATING ROOM



S4Game Consortium

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CASE 6.

MISSING INSTRUMENT

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THEORETICAL INFORMATION

Generally, many activities go simultaneously on in our working environment (the ward, the operating room), or we are so absorbed in our own thoughts, that we fail to recognize those things that could pose a serious threat to the safety of our patients during surgery. Situation awareness describes an individual's perception, comprehension, and subsequent projection of what is going on in the environment around him/her. The concept of situation awareness belongs to the group of soft skills that include teamwork, communication and managing hierarchical lines of communication. The lack or temporary loss of situation awareness may be the cause of a variety of unexpected and catastrophic events (Gluvas *et al.*, 2016; Nomikos, 2018.).

A retained surgical instrument is considered to be any item inadvertently left behind in a patient's body during surgery. In 2013, the Sentinel Event Alert from the Joint Commission drew the attention of clinicians to the dangers of retained surgical items after invasive procedures. Depending on the type of object retained and the length of time it is retained, these retained surgical items can cause infections and death, and surviving patients may sustain both physical and emotional harm (Infection Control Today, 2017; Joint Commission, 2013).

Retained foreign objects are most commonly detected immediately post-procedure by counting or by X-ray, during follow-up visits or from the patient's report of pain or discomfort. The most commonly left behind retained surgical instruments are (AORN, 2017.):

- Soft goods, such as sponges and towels.
- Small miscellaneous items, including unretrieved device components or fragments (such as broken parts of instruments), stapler components, parts of laparoscopic trocars, guidewires, catheters, and pieces of drains.
- Needles and other sharp implements.
- Instruments, most commonly malleable retractors.

High body mass index is the most common risk factor of retained surgical instruments, but adhesion formation after previous abdominal surgery, multiple staff turnovers during long lasting procedure, an emergent/urgent procedure (most often bleeding and its control) or unexpected change during surgery

also increase the risk of leaving foreign objects inside the patient. Occurrence of retaining instruments was nine times as likely when an operation was performed on an emergency basis and four times as likely when the procedure changed unexpectedly (Gluvas *et al.*, 2016).

The most common causes of retained surgical instruments are the absence of guidelines, failure to comply with existing policies, problems with hierarchy within the operating members, failure in communication between the surgical team, failure of staff to communicate relevant patient information, and inadequate or incomplete training of staff.

The most common way to prevent retained surgical instruments is by simple counting. Despite today's modern technical advances, this ancient method still works best, even if manual counting protocols have a 10 to 15 percent error rate. In addition, 80 percent of retained sponges occur with what staff believe is a correct count. Improvements to counting procedures are the most obvious solution to the problem, surgical teams have to embrace standardized practices, meaning to develop and sustain reliable counting practices that ensure all surgical items are accounted for and recorded (Joint Commission, 2013).

Breakdowns in teamwork and communication are common risk factors for unintended events like retained surgical instruments and sponges, wrong-side/wrong-site, wrong-procedure, and wrong-patient events and inadvertent disease transmission to transplant recipients. In this case, communication is a secondary skill, however it routinely finds in the top three persistent root causes of patient safety issues in US hospitals. Furthermore, teamwork and communication processes have also been associated with case efficiency, operating room utilization and scheduling and burnout.

In this practical case, teamwork and communication are secondary skills, however at least as essential components in the health professional's practice. Surgeons, the operative staff, and other direct care providers along the perioperative continuum can directly support to maintaining a context for effective teamwork by adopting a team-oriented attitude in their daily work and committing to actively participate in team strengthening activities such as briefings and debriefings. Committing to demonstrate and role-model effective teaming attitudes and behaviours in practice are powerful mechanisms for meaningfully optimizing surgical care processes and outcome for patients, as well as the daily work experiences of the teams, working to provide world-class surgical care (Weaver *et al.,* 2017).

Assuming that there is a set of common purposes regarding practical cases aimed at developing your situation awareness with the following **learning objectives**:

- To recognize your own situation awareness level.
- To monitorize unexpected events and their consequences continuously.
- To improve information gathering skills.
- To organize surgical team effectively.
- To develop communication skills under time pressure.
- To evaluate the results of your problem management.

The necessary **competencies** to manage properly a similar situation:

- Knowledge of a correct situation awareness process.
- Keep in mind that an unexpected event can happen at any time.
- Ability to demonstrate conscious presence.
- Effective relationship management (quick adaptation to the new situation).
- Appropriate communication techniques between the team.

METHODOLOGY AND TRAINING APPROACHES

Assuming from the outset that the trainee already knows how to use S4Game and before starting this practical case (briefing), he should be informed by the trainer regarding the learning objectives associated with it.

The performance of the activities proposed in this practical case implies that the trainee follows a series of sequential activities', each one presented with 4 proposals for resolution, being only one of them the correct one. Marking the correct option, the trainee will proceed to the next activity, until the entire process is complete. The success of the practical case resolution will be assessed by the number of correct and incorrect options selected by the trainee throughout the proposed process.

After completing the practical case (debriefing) the trainee, with the supervision of the trainer, should reflect about it and carry out the consequent appreciation of the developed learning, using a checklist developed for this purpose.

PRACTICAL INFORMATION

In this case study, we would like to present that each team member has essential role in the outcome of surgery in the operating room. To avoid the patient from further complications and surgical interventions, continuous observation and attention is required from all members of the surgical team. A small inadvertence of any team member or failure in communication between the staff, may seriously affect the outcome of surgery and cause lifelong complications and more serious problems for the patient.

In a transplant centre, Monday morning a 46-years-old male patient is scheduled for kidney transplantation due to a severe polycystic kidney disease. The surgical team consists of a urologist and a surgeon experienced in transplantation as an assistant, an anaesthesiologist, an anaesthesiologist assistant, a scrub nurse, and a circulator. If necessary, a PGY 5 resident is ready to scrub in.

The patient had a 10-years known history of multiple cysts in both kidneys, and so far, its complications have been conservatively treated. The patient had hypertonia, around 160/100 mmHg, but with antihypertensive drug treatment it can be maintain at 140/90 mmHg value. In the last few weeks, he is presenting complains of right flank pain, generalized headache, swelling in his ankles and feet and an increase in size of the abdomen. He has no history of admission, nor drug or food allergy. He has a family history of diabetes mellitus type 2; his mother is also diabetic. The patient underwent the following investigations: ECG, Echocardiogram, common laboratory test including urinalysis, abdominal pelvic USS, and abdominal CT- and MRI-scan, lipid profile, liver- and renal function test.

MR-imaging showed multiple renal cysts on both sides. Some of the cysts also showed high protein or haemorrhagic shares. In accordance with the previous MRI scan, the non-contrast CT examinations showed clear signs of space-occupying cystic lesions with polycystic kidney, low-grade ascites. Occasionally slightly enlarged lymph nodes were found. His restricted renal function showed a severely decreased Glomerular Filtration Rate (GFR), which was under 15 ml/min/1.73 m2; serum creatinine level was permanently above 850 micromoles/litre, while blood urea nitrogen (BUN) test was near 30 millimoles/litre. His urine output was under 400 ml/day (oliguria).

Based on his findings, dialysis treatment was started, and the patient was added on the transplant list and a suitable donor organ was found for him within half a year. Due to recurrent but also increasing complaints, marked restriction of lifestyle and the risk of dialysis a right sided nephrectomy was performed before the planned kidney transplantation.

Preoperatively the patient is conscious, oriented, afebrile, haemodynamically stable, with a regular auscultatory finding on the heart and lungs and without neurological outbreaks. The patient is negative

for allergies. Preoperative laboratory analyses were acceptable. At 8:30 general anaesthesia introduced and maintained with intratracheal narcosis without any complications.

The surgery lasts 5 hours, avoided any unusual things. Firstly, both cystic kidneys were removed from upper and median laparotomy. Their total weight was nearly 10 kg, and the patient's abdominal circumference was reduced by 20 cm after surgical intervention. After bilateral nephrectomy, the first operating area was closed with two-layer, running suture lines. Secondly, the left cadaver kidney graft was implanted through another incision into the right iliac fossa. During the whole procedure, the members of the operating team have continuously informed each other and followed the steps of surgery. Halfway through the surgery the surgeon asked an account of the used equipment and towels, at this time everything was found to be in order. The surgeon started closing the second incision, parallelly the operating staff summarized the instruments, swabs and towels used during surgery. The scrubbing nurse realized that a swab is missing. At this point, the first incision has already been closed and the second one was also almost closed.

The surgeon immediately assessed the situation and gathered the needed information. Towels and swabs were recalculated immediately, however, the numbers were not correct a second time. The operating room assistant and the anaesthesiology assistant looked around the operating room but found nothing. After the surgeon thinks, the missing swab is still remained in the patient's abdominal cavity. Because both incisions were almost closed, and the surgery became long, the surgeon asked the mobile X-ray machine into the operating room to make sure there was no swab left in the patient. Unfortunately, or fortunately, X-ray examination did not show any foreign bodies in the abdominal cavity.

By this time, the surgery had been going on 6 hours and the swab was still missing, but there was no indication that it had remained in the patient. The surgeon finally decided not to look for it any further, the surgery was completed, the patient was awakened and placed in the ICU. The case was recorded in detail in the surgical diary and after awakening, the patient was also informed that it is possible that a swab remained in his abdominal cavity as a foreign body. For the next 4 days, the patient's condition was stable, he was admitted to a sterile room, his wounds healed nicely, and there was no sign of graft rejection, or inflammation, or possibly fever.

Every Friday, the operating block was fully cleaned and disinfected, which was performed in the afternoon, at the end of the surgical program. For proper hygiene, the equipment- including the operating tables - are moved. When this was done, the missing swab came out from under the legs of the operating table. Probably during surgery, the swab was fallen down, and someone accidentally kicked it under the operating table. As can be seen, even with the most careful attention and continuous cooperation, unexpected events may happen.

RESOURCES

To ensure that this serious game enables an effective approximation to real contexts where the present practical case is supposed to occur, the scenarios idealized in virtual reality should include the following elements:

- A standard operating room.
- Transplantation team – a urologist specialist and a surgeon and second assistant (resident PGY5).
- Anaesthesia – one anaesthesiologist.
- Nurse team – three nurses (circulating/anaesthesia/scrub).
- Patient – one male patient (with polycystic kidney disease).

ASSESSMENT

Situation awareness is crucial factor in safety critical domains related to individual and team performance and a key consideration in system design and evaluation of command-and-control systems, training programs and procedures. Furthermore, team briefings have to be a standard part of surgeries to allow chance for any team member to express concerns they have regarding the safety of the patient, including the potential for a retained surgical instrument. This will promote open communication among surgical team members.

It is important to point out all perioperative team members are responsible for preventing unexpected events. The first step of retained surgical instrument prevention is creating a safe surgical environment which is free from distractions, noise, and interruptions during critical phases of patient care, including surgical counts. Distractions, noise, and interruptions increase the risk of inattention and omission (e.g., not counting an item, thinking an item has already been counted) and decrease concentration (AORN, 2016.).

It is also important to accurately document the results of counts of surgical sponges, instruments, or any items intentionally left inside a patient (such as needle or device fragments deemed safer to remain than remove), and actions taken if count discrepancies occur. Tracking counting during surgical procedures is important to understanding practical problems and improve the everyday practice. Accurate data analysing is key to understand the frequency of retained surgical instruments, identifying the risk factors, and developing preventing strategies. Counting guidelines should be developed by multidisciplinary approach involving different specialists like surgeons, anaesthesiologists, scrubbing nurses, radiologists, etc. The main aim is to develop and implement effective evidence-based organization-wide standardized policy to decrease the defects to zero in the everyday surgical practice (Joint Commission, 2013).

The most important aspects are:

- Counting should be performed audibly and visibly by two team members engaged in the surgery, usually these are the scrub nurse and circulating nurse. The surgical team should verbally acknowledge verification of the count.
- Include counts of all items used during the procedure.
- Include counts of soft goods, needles/sharps, instruments, and small miscellaneous items, and document unretrieved device fragments.
- Serial numbers printed on pre-packaged sponges and instrument sets are correct. Handle the discrepancy according to the organization's policy.
- Counting should be performed before the procedure in order to establish a baseline count, before the closure of the operating field and at end of procedure.
- Guideline should be applicable in all invasive procedures.
- It has to be revised periodically and improve according to the current data.

Assessing situation awareness - including teamwork - is a complex process focused on the evaluation of the role of the different members of the surgical team. The checklist details parameters for assessment of situation awareness of serious game users. The following checklist may help to systematically analyse our awareness process and helps to identify the points to change **(Table 1.)**. For each statement, mark the level (1 to 7, 1 means poor competency, 7 excellent competency) in the column that best describes the situation awareness technique.

STATEMENT	1	2	3	4	5	6	7
How familiar are you with the situation?							
How much information have you gained about the situation?							
How good information have you been accessible and usable?							
How much are you concentrating on the situation?							
How much mental capacity do you have to spare in the situation?							
How aroused are you in the situation?							
How complicated is the situation?							
How many variables are changing with the situation?							
How changeable is the situation?							
I determine the factors most important to the decision, and then use those factors to evaluate my choices.							

Table 1. *Questionnaire for case 6 (Adapted from Taylor, 1990 - SART).*

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