Role of the perioperative nurse in safe surgical needles handling: Surgical count procedure

Zadania pielęgniarki w bezpiecznym obchodzeniu się z igłami atraumatycznymi w trakcie zabiegu chirurgicznego – procedura kontroli liczby igieł

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Abstract

Retained surgical items (RSI) are adverse events which lead to consequences such as subsequent surgery requiring another anesthesia and considerable increase in healthcare costs. Retrospective analysis of RSI reported to The Joint Commission between 2012 and 2018 concerning cases of foreign body retained in patients revealed that 11% out of all 308 cases of RSI were surgical needles or blades. There are numerous articles regarding the prevention of types of RSI like gossypiboma or textiloma whereas very few authors focus on the issue of retained surgical needles. The article is dedicated to the problem of proper surgical needles handling during surgical procedures – such needles may become a foreign body under certain circumstances due to their relatively small size. The aim of this article is to promote awareness of the perioperative nurses responsible for patient's safety during his/her stay in the operating room. Furthermore, the goal is to raise awareness on the subject of how to properly perform and document atraumatic needles count along with safe approach to sutures handling in general. Discussed recommendations are based on the latest national and global guidelines published by nursing associations, including perioperative nurses (Supreme Chamber of Nurses and Midwives, European Operating Room Nurses Association, Association of periOperative Registered Nurses), and other scientific literature on this topic.

Key words: nurse, patient safety, standard of care, foreign bodies, surgical needle

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Streszczenie

Zdarzenie niepożądane, jakim jest pozostawienie ciała obcego (ang. *retained surgical items* – RSI) w ciele pacjenta podczas operacji, wiąże się z konsekwencjami w postaci konieczności powtórnej operacji w celu jego usunięcia, poddania pacjenta kolejnej procedurze znieczulenia, a co za tym idzie – ze wzrostem kosztów opieki. Według retrospektywnej analizy przyczyn występowania RSI zgłoszonych do The Joint Commission w latach 2012–2018 11% stanowiły zdarzenia niepożądane związane z pozostawieniem igły chirurgicznej lub ostrza w ciele pacjenta, biorąc pod uwagę 308 przypadków, które zostały zaraportowane w tym okresie. W fachowym piśmiennictwie dużo opracowań poświęconych jest zapobieganiu pozostawiania w ciele pacjenta materiału opatrunkowego (gossypiboma, textiloma), natomiast niewielu autorów skupia się na problematyce ryzyka pozostawienia igieł atraumatycznych. Praca została poświęcona zagadnieniom związanym z postępowaniem z igłami atraumatycznymi podczas zabiegów chirurgicznych, które ze względu na swoje stosunkowo niewielkie rozmiary przy szczególnych warunkach stwarzają potencjalne ryzyko RSI. Artykuł ma na celu zwiększenie świadomości pielęgniarek operacyjnych odpowiedzialnych za bezpieczeństwo pacjenta podczas jego pobytu na bloku operacyjnym oraz uwrażliwienie ich na konieczność właściwego przeprowadzania i dokumentowania procedury okresowej kontroli materiału jednorazowego użytku i bezpiecznego obchodzenia się ze szwami chirurgicznymi. Zalecenia analizowane w artykule zaczerpnięto z najnowszych wytycznych krajowych i zagranicznych towarzystw zrzeszających pielęgniarki, w tym pielęgniarki operacyjne (Naczelna Rada Pielęgniarek i Położnych, European Operating Room Nurses Association, Association of periOperative Registered Nurses) oraz publikacji naukowych analizujących niniejsze zagadnienie.

Słowa kluczowe: pielęgniarka, bezpieczeństwo pacjenta, ciała obce, standard opieki, igła chirurgiczna

Background

The task of a surgical nurse is "(...) comprehensive, independent, professional, proficient, and planned preparation of the surgical procedure, and assisting in its course and supervision".[1] Assisting, understood as instrumentation, is inseparably connected with the responsibility for the initial and periodic control of the number of tools and the amount of disposable material used during the surgical procedure. The primary purpose of these activities is to ensure patient's safety. In addition to dressing material such as surgical drapes, swabs, setons and tupfers, disposable material also includes: surgical blades, sutures with atraumatic needles, injectable needles, vascular patches, vascular clip packs, and many other objects at risk of being left in the wound during surgery.[2–4]

Leaving retained surgical items (RSI) in the patient's body during surgery is much more frequent in abdominal and thoracic surgeries than in operations on other parts of the body.[5] According to the data from studies published over the last 19 years, the frequency of these events is estimated at 1 case in 5,500–18,760.[6–8] In 2019, Steelman et al. conducted a retrospective study in which they analyzed the reasons for the RSI reported to The Joint Commission, a U.S. non-profit organization accrediting healthcare facilities. Consideration was given to leaving foreign bodies during all invasive procedures. In the period from October 2012 to March 2018, 308 reports were received, of which 11% were events related to a surgical needle or blade as a foreign body. All cases have been classified as adverse events requiring monitoring to ensure that they did not caused any harm, including serious damage to the patient's health or death.[6]

Atraumatic needles can vary greatly in size depending on the application. They are used in many procedures taking place in the operating theater. Some procedures require even hundreds of surgical needles, which is directly related to the number of stitches needed (e.g., cardiac and vascular procedures).[2,9,10]

In the case of RSI in the peritoneal cavity, 2 different mechanisms of the reaction of the body to the foreign body can be distinguished. In the 1st one, aseptic fibrosis of the tissue occurs, leading to the formation of adhesions and encapsulation of the left material. In the 2nd one, the migration of the foreign body to the lumen of the gastrointestinal tract is observed, most often to the small intestine, although cases of RSI penetration to the stomach and large intestine have also been reported. Analysis of data on the effects of leaving a foreign body in the patient's body shows that it rarely causes death (up to 2% of reported cases), while in 30–59% of cases, it is associated with re-admission or prolonged stay at hospital, in 69–83% of cases the patient requires another operation, in almost 45% of cases sepsis or other infections occur, in 10–22% of cases a fistula is produced or a small intestine obstruction develops, and in 7% of cases internal organs are perforated.[8,9]

In the professional literature, many studies are devoted to the prevention of leaving the dressing material (gossypiboma, textiloma) in the patient's body, while few authors focus on the issue of risk of leaving atraumatic needles.[9,11–14]

Factors that increase the risk of leaving the needle in the operating field include:
- an urgent and highly dynamic procedure;
- complications, unexpected and sudden change in the course of the operation, e.g., conversion from laparoscopy to the open method;
- procedures in which more than 1 operational team is involved;
- change of personnel during the surgical procedure;
- a long operation;

– a procedure that results in significant blood loss (>500 mL);
– procedures in patients with obesity, especially II-degree obesity (BMI ≥ 35 kg/m^2 and above).[2,6,11,15,16]

Procedure for counting atraumatic needles

The first action to ensure the safety of the patient and staff is a reliable control of the number of needles that have been opened during each surgical procedure. The basic principles of the counting process include the cooperation of the surgical team and everyone's understanding of the essence of this procedure, which is to protect the patient from adverse events.[16] Thus, the surgeon is obliged to enable the instrumentation and assisting nurse to thoroughly count disposable material and tools. According to the analysis, more than 250 RSI cases were caused by obstacles to the counting procedure, which contributed to its interruption.[17] Only after the initial state of the disposable material and the number of tools are known to be in line with the final result, should the surgeon decide to close the body cavity.[8]

In the literature and foreign recommendations, guidelines about quantity control can be found:
– initial control, which is intended to determine the initial quantity of material and should be made absolutely before the skin is incised and preferably before the patient is in the operating room; the initial condition must be recorded by the nurse on the material counting sheet;
– when opening subsequent packages with needles, each of them should be recorded and added to the initial number;
– before the closure of the body cavity, which is referred to as the so-called first layer, e.g., the peritoneum, bladder, stomach, uterus; this means also a control before implanting the mesh, bone graft, heart valve, and any other implantation understood as closing a certain space in the patient's body;
– counting before suturing the skin tissue;
– so called "anytime count" – counting should take place each time at the request of any member of the operating team;
– every time the instrumentation or assisting nurse is changed; the check should be carried out by the instrumentation or assisting nurse who is to be changed and the one who is starting the shift, or vice versa, always according to the rule: one person finishing work and one starting work;
– final counting, carried out when none of the tools or stitches are used anymore and all of them have been removed from the sterile field; it is the result of the final counting that should ultimately be classified as: quantity of material conforming/not conforming to the initial state.[2,4,9,19]

According to the guidelines of European Operating Room Nurses Association (EORNA) of 2015, this procedure should be carried out at least twice and absolutely documented, as both operating nurses have separate responsibility for the compliance of the material used for the procedure.[4,18–20] Therefore, counting should be done aloud. It is also recommended that both the instrumental and assisting nurse see the material counted. In this way, both nurses are able to check the quantity, which minimises the risk of miscalculations. In the English nomenclature, there is a "3S" rule: "see, separate and say", i.e., see, separate (which refers to the fact that each counted object should be raised by the counting person) and say (the number).[2,4,20]

The atraumatic needles should be counted as soon as possible after the nurse receives them, but it is not recommended to open all the packages at the same time during the initial counting, as this would increase the risk of losing them or stabbing oneself during surgery.[4,21] After opening the package, the instrumentation nurse verifies if the number given on the package matches the manufacturer's declared number. This is especially true for seams that contain more than 1 needle (e.g., vascular and cardiac). If a discrepancy is found in the number declared on the inside of the packaging, these stitches must be removed from the sterile area, marked and put in a safe place in the operating room. They should not be removed from the room before the procedure is completed.[17,21,22]

If an atraumatic needle falls on the floor, the instrumentation nurse should immediately notify the assisting nurse about it. Her task is to pick up the needle and put it in a safe place so that it can be included in the next material quantity check.[22,23]

The counting procedure should always take place in the same order. The authors of the guidelines suggest, for example: first count the needles in the surgical field (needles secured in the field, on the vice), then those on the Mayo table, on the extra table (including the needle box), and finally the needles that fell on the floor and were picked up by the assisting nurse, or were contaminated and removed from the sterile field.[2] The order of counting, together with the rules of procedure unified for all members of the surgical team, will allow for a precise and efficient procedure to control the number of disposable material.[4,20]

If several procedures are performed during one patient's stay in the operating room, which have separate sequential procedure numbers, records of material counting should be kept for each procedure separately. This may happen, for example, in the case of a multi-organ injury where there are multiple operating sites and several operating teams are involved. If, on the other hand, the case is single and will later be described in the same way by the attending physician, it should have only one documentation including counting.[18]

Rules for handling atraumatic needles during operation

The basic rule during surgery, respected by all members of the surgical team, should be that all disposable tools and materials, including sutures with atraumatic needles, are distributed by the surgical nurse. Importantly, only she should collect them back and throw away after use.[8]

The task of a surgical nurse is to know where each of the atraumatic needles she has received is at any given time. It is the responsibility of each member of the operation team to handle the needles safely. Sharp objects should not remain unprotected in the sterile field, which would increase the risk of penetrating the surgical field, but also of puncturing the sterile drape, falling on the floor and stabbing staff or patients.[4,18]

Sutures that have not yet been used should be left in their original packaging until they are needed during operation. This will reduce the risk of stabbing and losing the needle. For this reason, it is not recommended to open too many sutures at the beginning of the procedure but to choose them on an ongoing basis.[2,4,]

Needles from used seams should be stored in a sterile disposable hard-walled container, often called a needle counter (because of the sponge with numbered grids inside). Such containers, apart from making it easier to control the number of needles, enable safe waste management after the operation. It is recommended to place only 1 needle in 1 numbered grid to prevent counting errors. Moreover, the authors of the American *NoThing Left Behind* project, aimed at developing safe standards in the handling of disposable material and preventing the mistake of leaving foreign bodies in the operating field, recommend that the number of needles in the sterile field at any given time should not exceed 40. In their suggestions, there was a postulate that each box filled with 40 needles should be checked by the instrumentation nurse, closed and given to the assisting nurse. This will reduce the number of needles in the sterile field and facilitate counting, while preventing re-use of sutures once used and reducing the risk of exposure to infectious material.[2,18,29] Data show that the largest number of occupational exposure to infectious material occurs through stabbing with a contaminated needle.[25]

The recommended way of passing needles between members of the operating team is to pass them on in a closed tool (preferably in a vice). This applies to both administration to the operator and administration to the instrumental nurse by the surgeon.[8,24,25] Small needles, i.e. ,those whose length is conventionally less than 15 mm, or sutures with 2 needles, can be passed fastened on the tool by a fragment of the suture instead of the needle with a tool with rubber shods. An unacceptable form of giving needles to a surgical nurse is to throw them unprotected onto the sterile surgical operational field.

An interesting proposition that would reduce the risk of needle loss and stabbing seems to be the use of plastic trays with dimensions of approx. 23 × 13 × 5 cm, into which the surgeon could put the tool with the suture. This solution was proposed by the authors of the *NoThing Left Behind* project, suggesting that in this way the surgeon can remain focused on the surgical field. This is particularly important when handling small needles, which are among the most often lost in operations.[2] Magnetic mats with anti-slip properties are also available on the market. Their flexible structure allows them to fit to the shape of the patient, and the magnets prevent the tools deposited on them from slipping.

Procedure of non-compliance in material counting

For the purpose of this article, the following needle size classification has been adopted:

– microneedles: from the smallest available length to 5 mm;
– small needles: 6–15 mm;
– large needles: from 16 mm to the largest available length.

The moment a needle is ascertained to be lost, terminology should be used to describe the length of the needle in millimeters (e.g., 9 mm, 37 mm) instead of the seam size to which it was attached (e.g., 2–0, 3–0). This is due to the fact that one size of suture material can be available with different needle sizes. For this reason, it is recommended to leave the surgical suture packages at a specific point in the sterile field (bowl, box) until the last count of the material has been carried out in order to have access to its specifications (number, length and type of needles that were in the package).[2,4]

The first step in the case of an inconsistency in the counting of material is to immediately inform the surgeon in charge of the operation about the type and amount of material sought and to obtain information that the doctor has acknowledged the report of the circumstances. If the patient's condition allows it, the surgical procedure should be stopped, and the surgical field searched. The operating nurse should clearly request this.[7] At the same time, the nurses will repeat the search of: the sterile area with particular attention to the area around the operating wound, the occupancy and non-sterile zones of the operating room, including the floor, the material baskets, and all other baskets in the room.[22,23] Magnetic rollers may be helpful in finding needles on the operating room floor.

If an atraumatic needle is not found, it is recommended to take an X-ray and read it before the surgical wound is closed and the patient leaves the operating room. In facilities with no formal procedure to take an X-ray, it is decided by the doctor responsible for the operation. In both cases, the patient's condition must be taken into account.

Studies show that the best results in finding needles on X-ray films are obtained when they are read by a radiologist.[7,21,26,27,29,30]

The question of when the X-ray should be considered helpful in locating lost surgical needles remains a debatable aspect. The study carried out in 2017 in the USA shows that an 8-millimeter suture needle can be seen with a naked eye,[28] while the results of a more extensive study of 2003 carried out in Australia prove that the smallest needle that most people were able to see on at least 1 in 3 X-rays was a 17-millimeter long needle. Only 13% of people noticed a 13-millimeter long needle. The authors of the second study focused on needles left in the abdominal cavity or chest. The conclusions of their work stated that taking X-rays to find a needle less than 13 mm in length is an exposure of the patient to unnecessary X-rays with very little chance of finding the needle.[2,21,29]

Some of healthcare institutions involved in the abovementioned studies have developed formal procedures for dealing with deficiencies in the number of needles after surgery, including a mandatory X-ray. The staff of these hospitals declare a lower level of anxiety associated with similar situations, explaining that they feel more comfortable with the introduction of official instructions.[16,27]

Known cases of surgical needles left in the surgical wound, which required repeated surgery to remove them, concern needles that are more than 17 mm long or smaller but are located in areas such as the eyeball. Specialists unanimously confirm that microneedles and needles less than 10 mm long are not detectable on pure intraoperative X-ray film or are detected rarely. Even if they were identified in the photo, it is unlikely that they could have been found and removed during the operation. In addition, there is no evidence that they could cause damage to large body cavities such as the abdominal cavity. Therefore, it should be assumed that large needles have the greatest chance of being found by X-ray.[2,16,20,29,30]

Documenting the counting procedure for disposable material

It is important that the model protocol for the operating nurse is accepted by the department nurse of the unit, approved by the management of the unit and introduced in the same version for the use throughout the operating theatre. The fact of the counting procedure carried out and its outcome must be recorded in the surgical records (the operating nurse's protocol), confirmed by both nurses, who are equally responsible for the content of the record, and attached to the patient's records.[4,18,20,22] It should be remembered that medical documentation and records are legal evidence of the actions performed during the operation and the circumstances that influenced the decisions made. Therefore, all situations which may have had a significant impact on the proceedings should be noted in the comments. These include an extreme emergency procedure, i.e., a procedure whose omission is associated with the possibility of loss of life, amputation of a limb or loss of organ function. According to the results of the analysis of RSI cases made by Modrzejewski et al., in 6 out of 12 cases there were no surgical nurse's records, which made it impossible to identify obstacles in the material counting procedure.[8]

The comparison of the initial counting and final counting result of atraumatic needles should be noted as correct/incorrect. If there are discrepancies in the quantity of material or counting is omitted for various reasons, an appropriate record should be made, considering the circumstances, e.g:, "the surgeon identified the case as life-threatening and, upon the patient's rapid arrival in the operating room, surgery was started immediately, leaving no time for the initial counting of disposable material".[18,22]

All steps that have been taken to find the lost atraumatic needle should be described, including communication between members of the surgical team and other hospital staff, for example the radiologist who read the intraoperative X-ray. The documentation should specify what type of needle it was and its size. Similar information should be included in the patient records. If an object is found while searching for a lost needle, it should be indicated in the documentation that a calculation error has occurred. In both cases (lost needle and calculation errors), the situation should be reported according to an internal reporting system for such events, especially if an X-ray was used for the search. Lessons should be drawn from each such event, which should be used for periodic staff training.[4,18,26]

Conclusions

Leaving a foreign body in the patient's body in the form of a surgical needle is not common but can have serious negative health effects. The RSI is most frequently encountered during emergency procedures, during which there are complications, significant blood loss or when many surgical teams take part in the operation, during which nurses change, and in patients with BMI > 35 kg/m^2. It is recommended that the amount of disposable material be checked at least twice (initial and final check) and documented on the material control sheet adopted by the unit, and that this documentation should be included in the patient's medical history. Both surgical nurses participating in the procedure are responsible for the atraumatic needle counting procedure. All operating team personnel is required to handle atraumatic needles safely and allow operating nurses to control the amount of material and tools. If an atraumatic needle is found to be missing, the

instrumentation nurse should immediately inform the doctor in charge of the operation and take further steps to find the needle together with the surgeon. All means that were used to find it must be documented.

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