patient is that the PACU nurse no longer experiences central nervous system impairment, and is thus able to effectively use the highly technical skills and accurate judgement required when providing nursing care in the critical phase of a patient's perioperative period.

Another potential benefit to the patient, although unmeasurable at present, is that the air the patient breathes in the PACU does not contain waste anaesthetic gases. As a beneficial feature, this could improve the patient's recovery from anaesthesia.

At present, the scavenging system cannot be used for intubated patients. However, the physical plant staff are now designing a modification to the system which would enable it to be used with a T-piece.

Monitoring program (3)

In conjunction with modifying the ventilation system and developing a scavenging system, a monitoring program is being implemented to ensure that the first two activities are effective. The provincial industrial hygienist will survey the hospital periodically; but these services are in great demand in Manitoba, and often take many months to arrange.

With the recent experiences in PACU, administration is arranging rental of a nitrous oxide trace monitor, as previously mentioned. We are also evaluating the prospect of using commercially available nitrous oxide dosimeters to examine staff exposure levels.

Nitrous oxide dosimeters are pen-shaped devices which absorb nitrous oxide from the environment. The device is worn clipped to the staff member's uniform adjacent to the breathing zone, or within two feet of the head. The dosimeter is worn by the same employee for a period of one work week, and is then sent to a laboratory for analysis. This will provide a measure of the employee's actual exposure, as opposed to the "snapshot" readings provided by other types of monitoring.

Conclusion

Rectifying a workplace hazard in the PACU has turned out to be a challenging and exciting experience. Through the concern and participation of all levels of staff, the hospital utilized a problem-solving method, which resulted in a creative and innovative solution to a well-documented problem.

The scavenging system controls anaesthetic gas exposure in the PACU and offers the potential to be easily adapted by other health care facilities. This could significantly reduce the health hazards for patients and employees alike.

Those interested in obtaining further technical information may do so by writing:

Mr. Wilf Keith
Director, Physical Plant
Seven Oaks General Hospital
2300 McPhillips Street
Winnipeg, Manitoba
R2V 3M3
(204) 632-3186

Bibliography

1. Ackerman, J., "Monitoring waste nitrous oxide: one medical centre's experience," AORN Journal, Volume 41, Number 4, May 1985; pp. 895-898.

2. Brown, D., Wetterstroem, N. and Finch, J., "Anaesthetic gas exposure: Protecting the O.R. environment," AORN Journal, Volume 41, Number 2, 1985; pp. 590-608.

3. Cohen, E.N. et al, "Occupational disease among operating room personnel: a national study," Anaesthesiology, October, 1974; pp. 321-339.

4. Knill-Jones, R.P. et al, "Anaesthetic practice and pregnancy: controlled survey of women anaesthetists in the United Kingdom," Lancet, October, 1972; pp. 807-809.

5. Letts, D., Wilkinson, W., "A teaching guide for employees exposed to waste anaesthetic gas," Occupational Health Nursing, Feb., 1985: pp. 76-78.

6. Mattia, M., "Hazards in the Hospital Environment: anaesthetic gases and methy-methacrylate," American Journal of Nursing, January, 1983; pp. 73-77.

7. Stringer, B., "Nurse heal thyself: your work could be killing you," Canadian Nurse, November, 1984; pp. 19-22.

8. Waisman, A., "Working conditions in surgery and their effect on the health anaesthesiologist," Eksp. Khir. Anesthesia, May-June, 1967; pp. 44-49.

9. Wilson, C. and McEachern, M., "The effects of waste anaesthetic gases," Canadian Operating Room Nursing Journal, Volume 3, Number 6, December, 1985; pp. 13-20.

10. Lecky, J.H., "The mechanical aspects of anaesthetic pollution control," Anaesthesia Analogue, Number 56, 1977; pp. 769-774.

The problem of patient awareness during surgery

By Linda Rivington, R.N.

It is generally assumed that patients under general anaesthesia are rendered incapable of hearing, feeling or seeing anything. This assumption has pretty well been proven false in a number of cases.

Some post-operative patients are truly able to have vivid recall of specific events that actually occurred during their operation - when they were believed to be unconscious by members of the surgical team.

In recent years, studies have been done and articles written alluding to this fact. Some patients indeed can recall events, usually sounds or spoken words, that have occurred under the state of anaesthesia. This phenomena is known as "awareness."

If this "awareness" is indeed possible, then, as members of the operating room team, we must be considerate of the fact that patients might be exposed to careless talk, or to such statements by personnel in the operating room which could cause anger, mental anguish, or inadvertent complications during the post-operative recovery period.

Anaesthesia depth

"With the technique of balanced anaesthesia, paralysis has almost eliminated the ability to appreciate anaesthesia depth. Even a gross change such as awakening or overdosage can remain undetected, as the guidelines for drug administration may largely be derived from preset criteria unrelated to the particular patient that is being treated."[1]

Studies have been done with the use of tape recorders, verbal message transmission, suggestions, select sounds, etc., and relayed to the patient through earphones during surgery. In some cases, very optimistic and positive suggestions were spoken repeatedly via the tape recorder. The patients were reassured and suggestions relayed in terms of rapid recovery, feelings of well-being, lack of nausea and vomiting, etc. Placebo groups were subjected to a monotonous, low frequency noise with the chief objective of drowning out the actual sounds of the operating room. Control groups were allowed to hear actual sounds during their particular surgical procedures.

It was found generally that the different sounds seemed to have the most significant effect on the older patients in terms of post-operative well-being resulting in a shorter hospital stay.[2]

One physician routinely suggested to a large number of his patients, during the final stage of their operations, that recovery would be excellent. The result was a decrease in their need for post-operatiave medications to relieve pain, and a decrease in the incidence of nausia and vomiting.[3]

Even though there have been some difficulties in terms of conducting methodological studies, there has indeed been sufficient evidence demonstrating that some patients are truly able to retain meaningful sounds without subsequent "awareness" of this retention; and these patients were considered to be unconscious.

Case studies

During the summer of 1985 a women in England was awarded $20,000 by the courts. She experienced awareness under anaesthesia during a caesarian section. She had been given a premedication which not only put her to sleep, but made her a paralytic.

About the author

Linda Rivington, R.N., is a graduate of the Nursing Diploma Program, St. Lawrence College, Brockville, Ontario, and a graduate of the Operating Room Technique and Management Course, Hotel Dieu Hospital, Kingston, Ontario.

She was intubated, but somehow the anaesthetic failed to work. During the procedure she awoke and felt she was suffocating and aware of the fact that her throat was "blocked." She was unable to see or speak, but stated later that she had felt the surgeon cutting, placing his hands on her abdomen and being sutured. She was unable to communicate her suffering and emotional trauma due to the fact that she was paralyzed."[4]

Another case involved a young, healthy female undergoing a lumbar discoidectomy. She was anaesthesized, placed in prone position on bolsters and mechanically ventilated. The anaesthetist forgot to turn on the nitrous oxide. The patient had been paralyzed with curare and as a result was unable to move.[5]

Post-operatively, she stated that she had experienced a warm sensation at the operative site, but did not have any pain. She was able to see the clock in the room, but was unable to communicate to the operating room staff that she was awake. After the procedure she was able to remember the conversation that occurred in the operating room. Fortunately, there were no jokes or trauma inducing remarks. The women did experience nightmares for a short period of time. Fortunately, she was able to forget the episode completely.

In recent years, there have also been cases of unintentional "awake intubation." One investigation was done to examine the possibility that this occurrence may be more commonplace than is generally thought. Over a three month period, three anaesthetists recorded names of patients they anaesthetized for operations involving gyneco-logical, plastic, thoracic and general surgery. The premedication and induction techniques were similar in each case.[6] Out of 160 patients who had been paralyzed and intubated, three (or 2%) experienced a clear recall of events following venapuncture. One women gave an account of paralysis and intubation. She had made ineffectual efforts to communicate her terrifying experience, but to no avail. Another male patient in the study who was aware of his paralysis and intubation prior to an emergency operation stated he had not been disturbed by the incident.

Regardless, even if three out of 160 patients experienced awareness of paralysis or intubation in just one study, is it not therefore reasonable to assume that there are indeed many patients who are subjected to this potentially terrifying experience each day?

Possible causes

There have been various opinions concerning the probable causes of awareness during endotracheal intubation. One possible explanation could be related to those surgical procedures which are accompanied by difficulties with intubation. As these difficulties will prolong the procedure, during which time thiopentone is being circulated and redistributed, the patient could be left with an in-adequate cerebral blood level necessary to suppress consciousness at the time intubation is accom-plished.

Some studies reveal that either inadequate or no premedication may be a cause of awareness during intubation. Pre-oxygenation is believed to be another cause in that, unless there are contra-indications, it would be better to pre-oxygenate with a mixture of both nitrous oxide and oxygen to provide some cover against other causes of awareness. An inadequate dosage of thiopentone was also cited as a possible cause of awareness during endotracheal intubation.

The above mentioned studies[7] clearly reveal the occurrence of awareness of endotracheal intubation; and even though some of the patients in the studies did not have an awareness of paralysis, some of them were understandably terrified by the experience.

It should be noted that post-surgical patients are sometimes reluctant to voice complaints or reveal these occurrences. This is disturbing in that the members of the operating room team may never realize or come to appreciate that some of their patients may be experiencing great emotional trauma.

Detection and prevention

There have been a few theories discussed and attempts made to prevent the phenomena of awareness during anaesthesia. However, since there are really no verifiable tests or outward signs of awareness, it has proven to be a difficult task.

It has been suggested that muscle relaxants should be used with caution, and only when absolutely necessary. If a patient's paralysis is only partial, he or she may be capable of responding effectively if awareness does occur. Reducing the amount of muscle relaxant administered could allow the patient this capability. Some physicians feel that narcotic supplementation allows for a reduction in the dosage of a relaxant.

Another method of detection is by inflating a blood pressure cuff on the arm above the systolic pressure. This will isolate one arm from general circulation prior to induction. If conscious, the patient, upon request, would be able to move the arm after induction. This would alert the surgical team to the fact that the patient is conscious and possibly experiencing discomfort as the arm will

have had no exposure to the relaxant.

Another means of detecting awareness is by monitoring cerebral function with an electroencephalograph. This method has had apparent success in the detection of the depth of both anaesthesia and hypoxia. The majority of suggestions, however, for prevention of awareness relate to the deepening of the anaesthetic agent. This is the usual course followed unless the patient's condition is such that he or she could not tolerate supplementation.[8]

Discussion

The operating room is generally considered to be the area where the patient is most vulnerable. Surgical patients place themselves totally at the mercy, in most cases, of complete strangers. The patient has no choice but to trust implicitly in the abilities of the operating room team. In no other area of health care are people rendered as totally helpless as they are in the atmosphere of the operating room.

This fact in itself places an increased responsibility on all members of the health care team in the intra-operative area. The total welfare of the patient must always be central in the thoughts and actions of every team member.

Prior to surgery, most patients have many unspoken fears. The anxiety experienced may be related to a number of factors. They are separated from their significant others and are placed in an unfamiliar environment. Most patients are seldom knowledgeable of hospital routines, particular those associated with the physical preparation for their surgical procedure, the surgery itself and their post-operative care. As well, some will have economic concerns associated with hospitalization.

Many patients fear post-operative pain, mutilation, changes in lifestyles and death. A lot of patients are modest and fear potential embarrassment or loss of dignity associated with body exposure. Some patients are experiencing grief or embarrassment or loss of self respect as a result of the potential change in a body part or in their normal ability to function. In light of these and other recognized pre-operative concerns felt and experienced by those patients destined for surgery, it is obvious they are vulnerable and probably highly sensitive to all stimuli.

Regardless of how hectic our days are as members of the operating room team, if at the end of the day we sum it up as having had four gallbladders, three hernias, etc., where has the total care concept or holistic approach to patient care gone?

If we are to be completely honest with ourselves, can we, in fact, state that the behaviour by all members of the operating room team is always comparable under general anaesthesia as it is during procedures under local anaesthesia conditions? Or, are we, at times, more "patient conscious" during local anaesthesia than during a procedure that calls for a general anaesthetic? Hopefully not!

The reference here is not to comparable changes in terms of patient safety or competence of surgical skills. What is under scrutiny here are the subtle changes in professional conduct which, if the patient were awake, may trigger feelings of insecurity and a lack of confidence and respect for their care givers.

Control and responsibility

Even though the possibility may be slight that our patients are experiencing awareness and auditory perception during surgery, as operating room nurses, we do have means at our disposal for controlling or being responsive to the situation. First and foremost, we must take a firm stand in the event the anaesthetist decides to leave the room during surgery. This is dangerous, unprofessional and unacceptable and should never be allowed.

Also, the operating room nurse can make an ongoing assessment for the following signs that can indicate awareness during surgery. It should be noted that these signs are not always consistent nor totally reliable, but they are indications in some cases of possible awareness during anaesthesia:

- lacrimation (secretion of tears)
- brochospasm
- tracheal tug
- swallowing
- change in blood pressure
- change in pulse
- change in pupil size
- sweating
- eye movement
- other body movements

If any of the aformentioned signs are apparent, the operating room nurse should make certain that the anaesthetist is made aware.

Conclusion

It is imperative that, as members of the operating room team, we always maintain a thoughtful, professional attitude which reflects in both our conversations and our actions. I believe that all dialogue during a surgical procedure must be optimistic and positive, with full consideration and concern at all times for the patient.

If a patient had auditory perception, and was subjected to careless, snide remarks or unnecessary joking, the possibility for damage to their emotional and physical well-being may well be irreparable. The dignity of the patient must, at all times, be foremost in our thoughts, words and actions.

References

1. Mainzer, J., "Awareness, muscle relaxants and balanced anaesthesia," Canadian Anaesthetists Society Journal, Volume 26, Number 5, pp. 386-390; University of Toronto Press (1979).

2. Bonke, B., Schmitz, P., Verhage, F. and Zaveling, A., "Clinical study of so-called unconscious perception during general anaesthesia," British Journal of Anaesthesia, Volume 58, pp. 957-964; Professional and Scientific Publications, BMA House, London, (1986).

3. Ibid, Bonke, B.

4. Discover Magazine, "When anaesthesia fails to anaesthetize," edited by Kevin McKean (Up Front department), Volume 7, Number 8, pp. 12-13; published by Time Inc., New York, N.Y., (1986).

5. Wilson, S.L., Vaughan, R.W. and Stephen, C.R., "Awareness, dreams and hallucinations associated with general anaesthesia;" Anaesthesia & Analgesia, Volume 54, Number 5, September-October; pp. 609-617; International Anaesthesia Research Society, Cleveland, Ohio (1975).

6. Ibid, Wilson, S.L.

7. McKenna, T. and Wilton, T., "Awareness during endotracheal intubation," Anaesthesia, Volume 28, pp. 599-602; Blackwell Publications, Oxford (1973).

8. Ibid, Mainzer, J.

Indiscreet remarks during surgery result in near fatal emotional problems

Operating room personnel who make derogatory or other kinds of indiscreet remarks during surgery can cause severe damage to anaesthetised patients. Two incidents reported in a recent edition of the Medical Journal of Australia and described in the Medical Post (February 10, 1987) point up the serious emotional problems that resulted when indiscreet remarks were made during surgical procedures.

Dr. Julius Howard of Bathurst, New South Wales, reported on two cases where anaesthetised patients heard and perceived disparaging comments about themselves while undergoing surgery.

In one case, a 19-year-old female college student who had previously been treated for obesity and shyness, was adhering successfully to a sensible diet and an adjusted social life when she underwent minor surgery.

The report in the Australian journal mentioned that the young women emerged from the operation without complications. Two weeks post-op she presented herself to Dr. Howard's office crying and depressed. In the two-week interval, she had regressed to a state of depression and senseless bouts of eating. She even contemplated suicide for the first time in her life.

Dr. Howard, using hypnotic regression, where the patient returns to an earlier mental state or situation, was able to make her recall the events in the operating room leading up to what upset her. She vividly recalled, under hypnosis, even to the point of identifying the speaker, this remark from the surgeon: "She is fat, isn't she?"

In the other reported case, a 29-year-old female clerical worker had complained of chronic insomnia over the past three years - since she underwent a hysterectomy.

Again, by the technique of hypnotic regression, Dr. Howard was successful in revealing to the patient the incident in the operating room that precipitated the insomnia: the women, anaesthetised, had clearly heard the anaesthetist say: "She will sleep the sleep of death."

Between 0 and 80%

Since the time of her surgery, the women became vaguely aware of some fearful anxiety which kept her awake for three years - and she didn't know why. Through counselling, the report states, both women managed to overcome their problems.

Dr. Howard mentioned in the report that previous controlled experimental studies showed that between zero and 80% of patients picked up events or comments made during anaesthesia.

Patients, he said, were more likely to register and retain comments during an operation when the comments were relevant to them.

He mentioned that the most positive implication to come out of the study was that the surgical team could use this "awareness" phenomena to promote post-operative well-being and a speedier recovery.