A Report on Clinical Trials of NU GAUZE* Sponges including in vitro and in vivo comparisons with conventional cotton gauze sponges

In this study by Dr. Dale C. Birdsell, Chief of Plastic Surgery at Calgary's Foothills Hospital, and his associate Dr. John S.D. Davidson, also of Foothills Hospital, conventional cotton gauze sponges were compared with NU GAUZE* rayon sponges.

In the field of medicine, the most newsworthy items are usually new surgical procedures or medications. Little attention is given to advances made in the everyday 'tools of the trade', so to speak, such as instruments, sutures, dressings and sponges. As Dr. Birdsell says in his study, "One could take the view that the cotton gauze sponges presently used (in use for more than 50 years) are perfectly adequate and no changes are required. This would be wrong. Firstly, they may be adequate, but they are not perfect." Dr. Birdsell then gives a very appropriate comparison of our attitudes towards our 'tools of the trade', "If surgeons 20 years ago had not taken a progressive attitude concerning new suture materials, we would probably still be using silk and cotton sutures. Is it possible that the presently used cotton gauze sponge will someday be considered in the same category with silk and cotton sutures?"

Considering the work that the sponge is called upon to do, everything from prepping to dressing wounds, it should do these tasks with maximum efficiency and minimal possible deleterious side effects. A lot has been written about effects of lint in wounds and about maceration under wet dressings. Dr. Birdsell investigated linting and absorption, both in vitro and in clinical trials, comparing NU GAUZE* sponges and cotton gauze sponges.

The results of these clinical investigations showed that NU GAUZE* sponges fared considerably better than cotton gauze sponges.

ABSORPTION CAPACITY (in mL of citrated blood) OF NU GAUZE* SPONGES COMPARED TO 8 AND 12 PLY COTTON GAUZE SPONGES

Trial #	NU GAUZE*	Cotton gauze	Difference	Cotton gauze	Difference
		8 ply		12 ply	
1	17	11	6	14	3
2	16	11	5	14	2
3	17.5	11	6.5	14	3.5
4	18	11	7	13	5
5	17	11	6.5	13.5	4
Average	17.2	11	6.2 (56.4%)	13.7	3.5 (25.5%)

"The total absorption capacity of the NU GAUZE* sponge exceeded that of the 8 ply and 12 ply cotton gauze sponges by approximately 56% and 26% respectively. Furthermore, subsaturation amounts of blood were always more completely absorbed by the NU GAUZE* sponges in both the laboratory and clinical settings. In the latter case, donor sites were left drier and hence more amenable to easy and efficient dressing of the wound. As well, removal of the NU GAUZE* sponge from the wound was consistently associated with less disruption of the exposed and friable dermal capillary bed. Less disruption and thus less bleeding contributed to the efficiency of dealing with the donor site wound.

In vitro studies show quite conclusively that NU GAUZE* sponges contain less free lint than conventional cotton gauze sponges. Free lint in surgical wounds poses a real threat from the standpoint of inciting foreign reactions. Such reactions could enhance scar formation that may jeopardize the final outcome in plastic surgical procedures ranging in scope from cosmetic surgery to tendon and peripheral nerve surgery. Further, any retention of lint (a foreign body) could increase the likelihood of bacterial contamination progressing to infection."

Concerning the handling properties of NU GAUZE* sponges, both investigators found the enhanced resiliency of the NU GAUZE* sponges to be a positive feature when packing closed spaces or applying dry pressure dressings.

As Drs. Birdsell and Davidson summarized, "From these investigations, the NU GAUZE* sponges display features that make them comparable to, and in many aspects superior to conventional cotton gauze sponges. We found NU GAUZE* to have better absorption, while being less linting, less wound disruptive and more resilient than ordinary cotton gauze sponges. This makes NU GAUZE* a more rational choice for an all-purpose, absorbent sponge for dressing and wound care."

NU GAUZE* Sponges are available from Johnson & Johnson Inc.

For a copy of the complete clinical report, contact the Patient Care Division, Johnson & Johnson Inc., Montreal, Quebec H1V 2E4.

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Controlling anaesthetic gas exposure in PACU

By Mary Kubasiewicz, R.N., B.Sc.N.

The presence of anaesthetic gases in the workplace can make a health care facility a dangerous place for the employees who are there, ironically, to provide health care.

Studies from the Soviet Union, Denmark, United States and Great Britain have attempted to identify the effects of long-term exposure to nitrous oxide and the halogens - halothane, enflurane and isoflurane.

Identified health hazards for exposed personnel include spontaneous abortions and congenital anomalies; impairment of the central nervous system; and, increased incidence of kidney and liver disease. Although the methodology used in several of these studies was less than desirable (eg., lack of control groups, small sample size), there is still sufficient information to raise concern and to justify preventive measures.

Stating the problem

Exposure to anaesthetic gases occur when gas escapes into the environment due to anaesthetic technique, leaks in the anaesthetic delivery system, lack of a well-functioning scavenging system, and from the patient's exhaled breath.

In the operating room, emphasis has been placed on identifying leaks in equipment, improving ventilation systems, installing scavenging systems, and monitoring anaesthetic technique and work practices (Brown et al, 1985).

In the post anaesthetic care unit (PACU), the post-op patient is the source of waste anaesthetic gas, via expired air. In the literature, the limited discussion of the problem in the PACU focuses on ensuring an adequate air exchange and frequent monitoring.

Case study description

Seven Oaks General Hospital is a 326-bed community-based, acute care facility in Winnipeg, Manitoba. Seven Oaks runs an active surgical program, with $4^{1/2}$ slates daily, with approximately 25 patients requiring post anaesthetic nursing care.

The nursing staff and administration in PACU were aware of the risks of exposure to anaesthetic gas, due in part to articles published on the subject, and also to discussions held with nurses working in other post anaesthetic care units in the province.

Gas exposure

The PACU at Seven Oaks had been surveyed for nitrous oxide gas by Manitoba Environment and Workplace Safety and Health (Industrial Hygiene section) in August, 1984. The survey found that the gas did not create an overexposure situation for staff. However, by November, 1985, staff were reporting symptoms which could be related to anaesthetic gas exposure (eg., headache, lethargy). The combined efforts of nursing staff and administration through the Staff Management and Workplace Safety and Health Committee was successful in arranging for

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another survey of the area by the province's industrial hygienist. A survey was done in October, 1986, and the results showed that the levels of anaesthetic gases were too high. An improvement in the situation was required.

Solution

Addressing the issue of unsafe gas levels in the PACU involved a three-pronged approach:

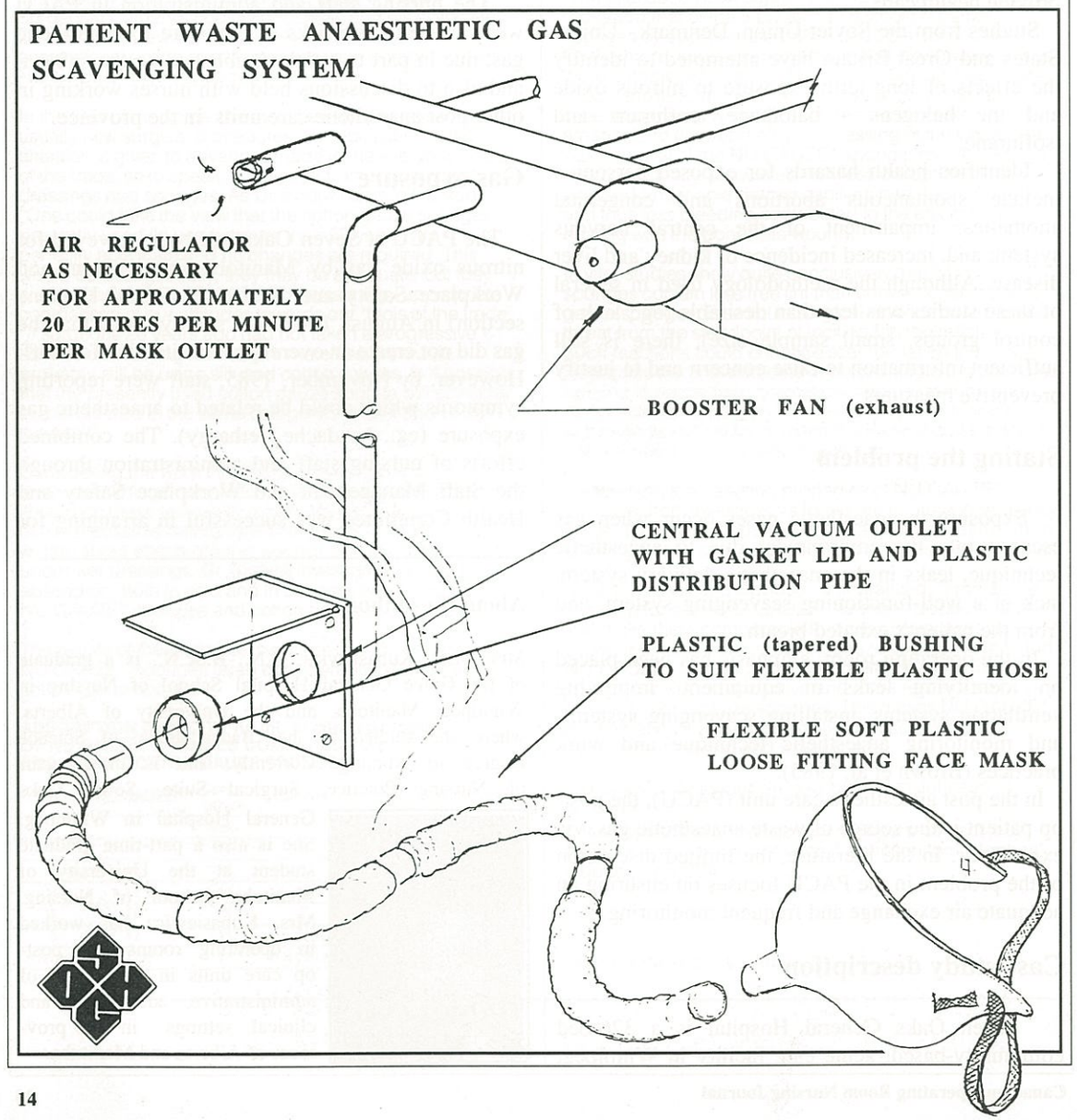
1. modifying the PACU ventilation system
2. developing a scavenging system
3. periodic monitoring in PACU

Ventilation system (1)

Upon investigation by the physical plant staff, it was determined that the room air supply could feasibly be changed from a variable air volume (V.A.V.) to a constant volume system. This would ensure a constant supply of 100% fresh air at all times. The existing room exhaust system is being modified to increase the number of exhausts in order to avoid air stratification, air pockets, etc. The current literature indicates that such attention to adequate exhaust ventilation and fresh air exchanges is the only solution to prevent the accumulation of waste anaesthetic gases in the PACU, when used in conjunction with periodic monitoring (Letts & Wilkinson, 1985; Mattia, 1983; Stringer, 1984).

Scavenging system (2)

In addressing the employee safety issue in the PACU, it became apparent that when dealing with an environmental pollutant suspected of being



carcinogenic, teratogenic, and mutagenic, the governing principle should be that the best solution is one which would address the source of the problem by preventing the exhaled anaesthetic gas from entering the environment.

The nature of nursing practice in the PACU indicates that the nurse remains close to the patient's breathing zone, and therefore is exposed to the anaesthetic gases before ventilation or exhaust systems can diffuse them through the environment.

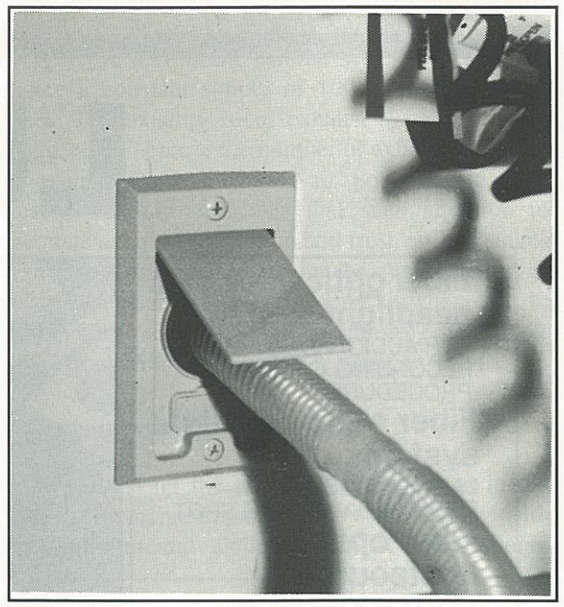
The Director of the Physical Plant, Mr. W. Keith, and the Chief Engineer, Mr. L. Shorrock, designed an individual patient scavenging system which reduces the level of anaesthetic gases in the nurse's breathing zone, and in the ambient air, or environment. Each patient who has had a general anaesthetic is provided with a face tent with exhaust tubing, which is connected to a wall exhaust outlet. **(See photos & Figure 1, preceding page).**

The scavenging system was designed and installed by the physical plant, and required only minor renovations in the PACU. A central vacuum outlet was installed in the patient cubicle, and was connected to the existing exhaust ventilation system. The disposable individual patient portion of the system consists of a length of flexible plastic hose, (Seven Oaks used disposable anaesthetic tubing) and an oxygen face mask. The cost per patient is approximately $1.95.

Close-up of scavenging apparatus on patient

Initially, the system was installed in three patient cubicles, and tested with a trace nitrous oxide monitor, which was rented from a local medical gas company. Results from the monitoring show only trace amounts in the ambient air in the PACU. A significant factor is that readings in a nurse's breathing zone are negligible when the system is used.

Presently, we are waiting for the province's industrial hygienist to return for a follow-up survey. However, we are so pleased with the system that



Close-up of a central vacuum-type wall outlet in the area of the patient cubicle

we are installing it in every patient cubicle. Most importantly, the nurses working in the PACU feel better and are able to concentrate on delivering patient care without worrying about the hazards of exposure to anaesthetic gases.

Groundless concerns

While the scavenging system was still in the initial planning stages, concerns were raised about the possible difficulties which might arise from having a device near the patient's airway. Such fears have proven to be groundless. While an elastic strap loosely secures the face tent, it can easily be removed to access the patient's airway.

Another area of concern was that the exhaust would affect the patient's air or oxygen supply. As the system causes neither discomfort to the patient nor changes to the respiratory effort, this concern was groundless as well. The Department of Anaesthesia, consulted throughout the developmental stages, gave its approval.

The nurses explain the purpose of the system to the patients as it is attached, or as the patient recovers. The patients have been most accepting of the system, and go along with it as part of their nursing care. Naturally, the PACU nurses use their own judgement - the initial patient assessment takes precedence over all other activities, and the scavenging system is not attached until the PACU admission activities are completed.

A major benefit of the scavenging system for the

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:

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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.

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