



**AN EXAMPLE OF PHYSICIAN—NURSES COLLABORATION: DELEGATION OF
SPINAL ANAESTHESIA FOR NURSE ANAESTHETISTS.**

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ABSTRACT

Background and aims: We report our experience of a physician-nurses delegation about the spinal anaesthesia by a nurse anaesthetists both trained and qualified to deal with the reduced number of medical staff in a district hospital.

Patients and methods: Through a prospective study of two years 2016-2017, all the acts of spinal anaesthesia did by a nurse anaesthetists were collected and the number of successful puncture, also the number of calls to the anesthesiologist, the failure rate of the block of spinal anaesthesia and finally incidents and complications occurred.

Results: Our nurses have arrived to make spinal anaesthesia in 852 sick or about 72% of all spinal anaesthesia, with successful punctures in 95.2% of cases and block failure in 2.5%, and post dural puncture headaches in only 1.4%. **Conclusion :** Subject to rigorous training, a selection previously of a sick and a full availability of anesthesiologist, our nurses have arrived to make spinal anaesthesia with efficiently and smallest incidents and complications.

KEYWORDS: Physician-nurses delegation, nurse anaesthetist, spinal anaesthesia.

1. INTRODUCTION

Delegation of tasks refers to the action whereby the physician entrusts, under his / her responsibility and supervision, to a health professional the carrying out of a care act. It is considered by some to be a possible solution to health demographic problems. In all cases, this delegation must be done in accordance with the good practice recommendations, and requires further training for the professionals concerned and validation of some experience. In our context, we used the delegation principle in order to resolve the staff problem, and we allowed the qualified and trained nurse anaesthetists (NA) to practice spinal anaesthesia (SA) in selected patients under the direct responsibility of the anesthesiologist physician (PA).

2. MATERIAL AND METHODS

2-1. Local and administrative context

Our anaesthesia and intensive care team consists of two PA and ten nurses, including six NA with initial training of three years to obtain a state diploma in anaesthesia and a two-year additional training to obtain a higher certificate. We deal with the anesthetic activity of the operating room and intensive care unit (ICU) of the 3rd military hospital in Laayoune. The ICU is composed of 4 beds and is managed by fore nurses, and the operating room managed by the six NA, contains 4 operating rooms dedicated to traumatology-orthopedic surgery,

urology, visceral surgery, proctology, digestive endoscopy and ORL surgery. During 2015, 150 patients were admitted to intensive care, and 986 patients were treated, with 266 acts of general anaesthesia (GA) and sedation (27%), 667 acts of spinal anaesthesia (SA) (67.6%) and finally 53 peripheral blocks (5.4%).

The main issue raised in our practice was related to an inferior medical and paramedical staff to ensure both anaesthetic and ICU activity, and more specifically existence of a single PA during quarterly holiday periods. In order to remedy this problem, we proceeded to delegation principle of some acts of anaesthesia to NA in selected patients, and more particularly SA. In Moroccan deontology, acts of anaesthesia are part of acts that the nurse can do under PA responsibility.^[1] SA often remains a purely medical act and rarely delegated, contrary to GA. Before doing so, our NA opted for theoretical and practical training, and at the end we started delegation experience after the agreement of the ethics and research committee of our institution and the written consent of patients.

2-2. Training of nurse anaesthetists

It started in October 2015 and lasted 3 months, it consisted of theoretical courses which concerned in addition to the rules of anesthetic safety and the rules of asepsis, the anatomical landmarks, indications and

contraindications of SA, its technique of realization, sensitivo-motor and sympathetic block characteristics and finally the incidents and associated complications. These courses were accompanied by practical sessions on selected patients where each NA was a spectator of ten acts of SA, then assisted on ten other acts and then supervised on ten subsequent acts.

At the end of this training, our NA were deemed to be able to perform the SA on the condition of a preliminary selection of patients, and a mandatory presence of the nearby PA can thus intervene at any time. The sitting position and the middle way were chosen for SA learning. The puncture was done by a 25G pencil point needle. Puncture failure was defined by the absence of cerebrospinal fluid reflux after two separate attempts at the same lumbar space, and SA failure was defined by the failure of the motor and sensory block requiring recourse to sedation supplement or at GA. In case of failure of puncture, the NA had to call the PA, he was not allowed to change the puncture space without notifying PA.

2-3. Selection of patients

It was ensured during pre-anesthetic consultation, which also emphasized three elements that were the indication of SA, feasibility of SA defined by the criteria predicting difficulty of the technique during the clinical examination of the back and ASA class. All these elements were transcribed on the anesthesia file that specified in the final conclusion that SA was chosen as anesthetic technique and that it could be done by NA. On operation day D, the file was checked on the operating room by anesthesia team and the NA only performed SA after PA authorization. Thus, in this study, were included all patients classified as ASA I-II over the age of 15 years and under 60 years, not being treated with interfering haemostasis, having a BMI $\leq 35\text{kg} / \text{m}^2$ with a condition of visible or easily palpable spinous processes and without morphological abnormalities of the spine on examination, and which were planned for a programmed surgery whose SA was the technique of choice.

Between January 2016 and December 2017, all SA acts performed by NA were collected during a prospective and observational study, as well as the number of successful puncture attempts, the number of PA calls in case of puncture failure. Failure rate of SA block, per-SA incidents as vascular puncture or root irritation, and post-SA complications as headaches, neurological disorders or fever.

3. RESULTS

During this period, our NA performed 852 SA acts of a total of 1184 SA, a percentage of 71.9%, with 414 SA in 2016 and 438 SA in 2017 (Figure 1).

The success of puncture was present in 51.2% from the 1st attempt, with a rate increasing from 33.3% in 2016 to 68.1% in 2017, and in 35% on the 2nd attempt, with a rate of decreased from 47.1% in 2016 to 23.5% in 2017. PA was called in 13.8% of cases (118 calls), 19.5% in 2016 (81 calls) and 8.4% in 2017 (37 calls). He reacted by advice in 9% of cases (13.8% in 2016 and 4.6% in 2017), either for an adequate repositioning of the patient and a reorientation of the needle or for a change in the space of puncture, and by effective intervention in 4.8% (5.7% in 2016 and 3.8% in 2017) (Figure 2).

Failure rate of SA block was 2.5% in average, it was 3.4% in 2016 and became 1.6% in 2017.

Per-SA incidents were noted in 48 patients including 28 vascular punctures with a percentage of 3.3% and 20 root irritations with a percentage of 2.3%. In 2016, there were 19 vascular punctures (4.6%) and 13 root irritations (3.1%), and in 2017, 9 vascular punctures (2%) and 7 root irritations (1.6%). For post-SA complications, post dural puncture headaches were present in 1.4%, with an incidence of 2.2% in 2016 increased to 0.7% in 2017. These headaches were moderate, and have responded well to symptomatic treatment without the use of blood patch. There were no cases of hematoma, neurological disorders or meningitis (Table1).

Table 1: Percentage of per SA incidents and post-SA complications.

	Vascular punctures	Root irritations	Post SA Headache
2016	4,6%	3,1%	2,2%
2017	2%	1,6%	0,7%
Total	3,3%	2,3%	1,4%

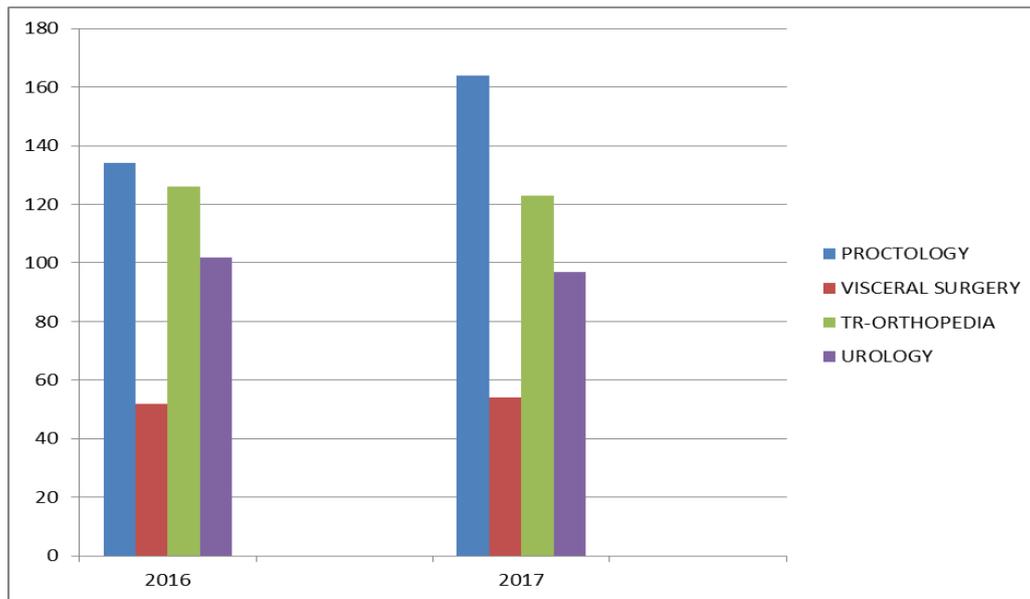


Figure 1 : Number of SA made by NA in 2016 and 2017.

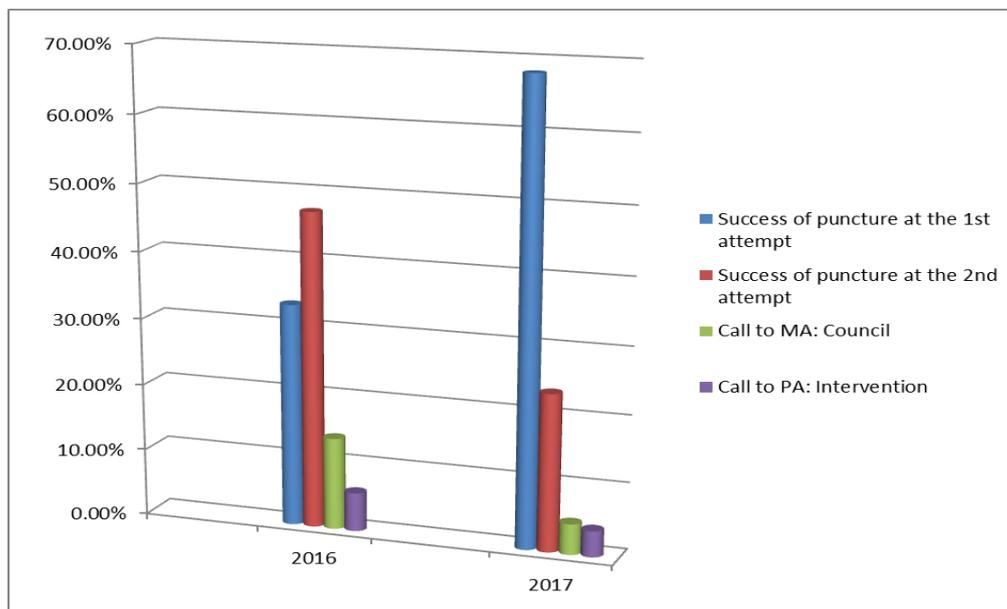


Figure 2 : SA puncture success rate with typology of PA calls.

4. DISCUSSION

The delegation of some of PA activity to NA in anesthesia has been in existence for a long time. We are probably the most advanced specialty in this field; the typical example is the practice of GA that PA delegates NA to administer induction drugs, ventilate and intubate, and provide per-operative monitoring. Indeed, the decree of NA competences allows them a certain number of technical and intellectual acts under PA responsibility. The question is no longer about task delegation principle but rather its extension to other acts. The delegation was organized in several countries as a new form of physician-nursing cooperation providing a solution to health demography problems with a positive economic impact.^[2, 3] In the United States, Certified Registered Nurse Anesthetists (CRNA) have been practicing anaesthesia for more than a century and have acquired

official and legal authorization to perform all anesthesia without any restrictions.^[4] The training of CRNA is 2 to 3 years (Master) after 4 years of nursing training and at least one year of professional experience. However, this situation sometimes poses great conflicts between PA and NA. In France, the situation is well known and governed by regulations.^[5] The 2 years training after 3 years of seniority is recently recognized at the Master level. The decree of competences, which dates from 2002-2004, is still in force but with a steady evolution in a desire to substitute a concept of mission for that of act list. The occupational repository stipulates that the NA works in collaboration with the PA, and French Society of Anaesthesia and Critical Care recommendations confirm this concept of team but reminds that it is under PA responsibility. NA is not allowed to make SA at present, but it can apply GA and intraoperative

resuscitation as long as PA can intervene at any time, as well as the management of postoperative pain. PA must have first examined patient and established protocol, and his responsibility is full and complete. In the Health System Modernization Act 2016-41, published in the Official Journal of 27 January 2016, Article 119 (Article L. 4301-1 of the Public Health Code) creates the legal framework of Advanced Practice Nurses (APN).^[6] This law defines advanced practices as: "evaluation and clinical conclusion, technical acts and clinical paraclinical surveillance. So, things will certainly change in a few years, especially with the adoption of the Licence-Master-Doctorate (LMD) system in the professional training of NA. These could thus acquire new skills, and benefit from repeated training. The Rosay team's experience in central venous catheter (CVK) is very illustrative and should be promising for other teams, whose 90% of CVK were asked by trained nurses, but risk analysis in difficult cases remained medical.^[7]

In our training, we used delegation principle to answer the problem of anesthetic team staffing, which sometimes has a remarkable decrease in the face of a surgical activity that continues to increase every day. The choice of SA as subject to this delegation was motivated by two essential elements, firstly it is a technique relatively easy to learn although it can be burdened with complications that remain rare and avoidable,^[8] and secondly it is the most used anesthetic technique at home.

Under the guise of rigorous training, and mutual trust, our NA managed to practice SA, with efficiency and minimal complications, at 852 patients between 2016 and 2017, which is about 72% of all SA. The strong responsibility of PA as delegator was the guarantor of this success. It concerned both the training of staff and the selection of patients with full availability at the right time and place. The duration of three months was largely sufficient for the training of a staff qualified at the same time by his studies in Anaesthesia (total of 5 years) and competent because of his experience and his know-how acquired through years of service similarly, the number of SA required to learn how to perform the technique.

The selection of patients was an essential step in our methodology. Its objectives were to select ASA-II patients without predictors of SA difficulty such as advanced age, obesity, and spinal dysmorphism to increase the chances of successful puncture on the first attempt and thus reduce SA incidents and complications, including hemodynamic incidents.^[9-11]

Finally, PA availability was the condition of success, and especially to patient safety, PA had to ensure the supervision of his delegate in gesture realization, and because he had to be close and respond immediately to calls to manage failures and incidents.

The number of successful punctures by the NA was high 95.2% whether on the first attempt (51.2%) or on the second attempt (35%) or after advice from PA (9%), who intervened by his own hands to make SA only in 4.8% of the cases. Indeed, a stage 1 and 2 stage condition of spinous processes is not always synonymous with an easy SA,^[11] which may explain this difficulty of SA found in these selected patients. The quality of NA training and their experience gained during the first year of 2016 study explains the success rate for the first attempt, which almost doubled against the number of calls to PA, which dropped by half during the second year of 2017. In the literature, the puncture failure rate varies from 1 to 6% depending on the series, and operator's experience was reported among the predictors of this failure.^[9, 12] We can compare NA experience to the youngest resident in Anaesthesia who makes SA under the supervision of the senior PA, whose learning curve increases over the months. The decision to change puncture space allowed by PA alone probably lowered NA skills and its chances of success, as well as the number of puncture attempts set at two, but this could be counterbalanced by a predictive ease of SA technique in these patients. SA failure rate of 2.5% remains acceptable compared to that reported in the literature, despite the presence of patient selection factor in our study.^[12-14] The risk of this failure even after a free flow of cerebrospinal fluid and adequate injection of local anesthetic is unpredictable and especially due to other causes independent of the technique.^[15] In addition, the failure has been remarkably reduced by more than half since 2016, which can also be explained by learning quality and experimentation of the NA who mastered the technique more and more.

Concerning incidents involving vascular punctures or root irritations, they remain a low incidence (5.6%) which decreased between 2016 and 2017. For post-SA complications, headaches remain a low rate (1.4%) compared to other series.^[16, 17] It can be related essentially to attempts number in our series which remained moderately low in relation more particularly to the selection of patients and the requirements imposed on NA including two attempts in a single lumbar space. Indeed the number of attempts and spinal dysmorphism are reported as predictors of headache.^[9] This rate dropped significantly by more than half between 2016 and 2017, which is a surplus in favor of the NA learning curve.

On the managerial level, this delegation allowed us to get several favorable elements for our practice on the periphery.

- to relieve PA from a time-consuming anaesthetic activity represented by the famous ASA I patients planned for minimal risk surgery, which fortunately represents the majority of our activity, allowing him to devote more time to heavy patients in the operating room, critical care and emergencies. PA examines

patients scheduled for SA, selects the easy planned SA, and establishes protocols, but acts only for difficult SA.

- to manage effectively the problem posed, while keeping a surgical activity with the same quantitative and qualitative characteristics with 1097 acts in 2016 and 1143 acts in 2017 compared to 986 acts in 2015.

- to value NA as a key element of anaesthesia, which could also perform certain medical and technical procedures. In our training, the paramedical team participates in the pre-anesthetic consultation, and is delegated to sedation and SA in selected patients. This delegation is very positively felt by NA, especially since it is supported by patients and surgeons satisfaction.

5. CONCLUSION

This work shows that under the guise of a rigorous training, the NA is able to perform SA in selected patients with efficiency and without incident or added complications, and especially their learning curve being very favorable. There is no reason to oppose in tasks delegation principle, on the contrary, it must be encouraged and legalized. This delegation must itself remain a medical act, that is to say, an adapted and thought-out response on a case-by-case basis in a given context. In our country, the health demography in peripheral hospitals suffers from serious difficulties, and when the PA is not entirely available, the NA is delegated to practice GA for all types of surgery, even in obstetrics, including GA morbi-mortality is known.^[18] SA delegation would therefore be justified to try at least to respond to this kind of problem, it must go through the quality training of our NA while waiting for their qualification thanks to an upcoming adoption of LMD system.

6. ACKNOWLEDGEMENT

The authors declare that they have no conflict of interest.

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