RESEARCH WITH A QUANTITATIVE APPROACH

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As of 2016, I have completed 42 years as a nurse practitioner, 30 of which I spent doing research using a quantitative approach. The principal theme of the studies developed and in development is the safe processing of health products, a topic filled with uncertainties, dogmas, and myths. Undoubtedly, when clean and sterilized material is the subject of research, it is suggested to study it in quantitative terms. The microorganisms and residues of dirtiness act like villains to be eliminated: if all of them were extinguished, if they were only reduced, how much they reduced, or if nothing happened.

Investigations with quantitative approaches are understood by the academic community as hard science, with a defined, concise, limited, reductionist, objective focus that is based on logical and deductive reasoning, and which looks for a relation between cause and effect. They test hypotheses and theories that control the maximum amount of possible variables and use specific and validated instruments and methods, and have, as a basic element of analysis, numbers and statistical analyses.

Tacitly, the intention of quantitative studies is to tend toward a generalization of knowledge produced. It was through this methodological path that I entered into the world of research at the Nursing School of the University of São Paulo (NS-USP) and I contributed and still contribute to the advancement of materials processing science. The privilege of being born as a researcher in the crib of USP made all of the difference in my professional career! Grand masters and colleagues that were excellently trained in research always taught me, inspired me, and motivated me to value the rigor of the method and to give strength to scientific evidence, separate from conflicts of interest.

Everything began with the opportunity to investigate a safe way of sterilizing heat-sensitive materials using paraformaldehyde tablets in environmental conditions, which was my Masters dissertation. I entered into the world of microbiology, developing laboratory skills to produce bacterial spores and challenge them under the conditions of sterilization. In my doctorate, I continued with the subject, exploring the maintenance of the sterilizing action of the already used paraformaldehyde tablets, since reusing the same group of tablets, at that time, was common practice. It is worth noting that early on I incorporated the importance of analyzing the relevance of a produced knowledge: obligingly, it should positively impact day to day practice, benefiting patients, professionals, and the collective. As a researcher, you must always be very attentive to identifying tensions that are not the same in practice. Longingly, I remember the first doctoral thesis I advised. It responded to the question about the safety of the use of double-woven cotton as packaging for autoclaving and the number of possible reuses, during a turbulent time in which the makers of disposable packaging condemned that type of packaging.

Observing my trajectory as a researcher, I recognize that I always had the courage, energy, and perseverance to demystify various dogmas. This was the case with the unsustainable demonstration of the sterility expiration period, with the "right" contamination of wet and stored material, with the contamination of stored materials in environments that did not have controlled humidity and temperature, with the cytotoxicity of surgical instruments when prepared without the use of gloves, with the cytotoxicity of surgical instruments when not rinsed with purified water, with the condemnation of tweezers autoclaving from mounted laparoscopic video-surgery, with the controversy of the reuse of several materials marketed as single use, such as angiographic catheters, electric scalpel pens, laparoscopic video-surgery accessories, hemodialysis devices, vitrectomy probes, sternotomy saws, and also the development of a method to comparatively evaluate the costs of using new and reused material. Some important knowledge about the use of "good and old" alcohol for the decontamination of semicritical material, hand hygiene/ surgical management with respect to environmental surfaces, and with a focus on the impact of previous cleaning, was researched. Studies with an applied quantitative approach to the processing of flexible endoscopes and environmental hygiene are also in development in order to respond to questions like: is it possible to clean the canals of endoscopes without friction? Negative pressure in the cleaning area of the Center of Material and Sterilization (CMS) aggregates value? Are liposuction cannulas and flexible orthopedic cutters cleanable? All of this new

knowledge was and can be rigorously constructed by adopting a quantitative approach, which counts microorganisms and measures organic residues and endotoxins.

A prerequisite *sine qua non* for the production of all of these studies in the area of material processing is the "wild" team of the research group that I coordinated and continue to coordinate, composed of post-doctoral fellows, doctoral students, masters students, students completing a specialization, and undergraduate students. I learn with them all of the time!

The discussions of superiority of one approach over the other with respect to quantitative and qualitative approaches are fruitless. The research question is what defines the methodological strand that will be adopted. If the tension generated in my study is: "What is the significance of the CMS for the hospital administrator," the indicated approach is qualitative. Its characteristics are different from those attributed to quantitative approaches: soft science, having a complex, open, holistic, and subjective, focus that is grounded in dialectic and inductive reasoning and which has meaning and discovery as the basis for the search for knowledge. Such an approach proposes the development of theories and the sharing of interpretations. Communication and observation are key to data collection, and the basic element of analysis are words, which have individual interpretation. Studies with a qualitative approach tend to search for singularity and not for generalization.

The act of research, understood as the search for plausible and consistent responses to a problem for which a response hasn't been found, is a tool of power, emancipation, innovation, and evolution for all of the areas of human knowledge, including the area of CMS. It allows for the information base to be amplified in order to exercise a critical and transformative practice, and contributes to the attainment of professional identity and autonomy. It defines distinct and singular roles and documents social relevance and the efficacy of the professional exercise.

As a researching nurse in the area of materials processing, I am convinced that, if investigations had not given sustenance to the practices of CMSs nationally, we would not only have lost leadership space in the sector but today we would also be impoverished in evidence-based practice for lack of primary studies. We are at a time when the world requires efficiency in what we already do correctly: sustainable (less consumeristic), rational (not to err on the side of excess or lacking) and, above all, patient-accessable practices.

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