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Centralized drug compounding units: an essential driver of patient safety

Unidades de preparación centralizada de medicamentos: práctica esencial para la seguridad del paciente

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In this issue of Farmacia Hospitalaria Cousins *et al.* address the need to promote the development of injectable drug preparation units in European Pharmacy Services to advance the improvement of drug safety and suggest that it is the right moment[1]. Preparation of ready-to-use drugs, especially intravenous infusions, both standardized and individualized, has been a unanimous and response of hospital pharmacy departments (HPDs) to the COVID-19 pandemic as they struggled to optimize drug utilización and enhance patient safety. The scarcity of some active ingredients, the constant change in dose forms and the high turnover rates and staff shortages in critical care units have been some of the factors catalyzing this response[2].

Today, 10 years after the enactment of Resolution CM/ResAP (2011) on the requirements that must be met to ensure the quality and effectiveness of pharmacy-prepared medicines to address patients' needs, centralized compounding units are a thriving reality. The Resolution is testament to the concern of Spanish health authorities with the conditions under which sterile preparations are compounded in the pharmacy setting, a procedure that still has a long way to go before it can be established as a generalized practice across Europe.

Luckily, the setting up of centralized compounding units is not a passing fad in Spain but rather an increasingly established practice, as reflected by the 2019 SEFH National Survey, according to which the number of such units had risen by 60% in the previous 5 years. The authors of the Survey attributed this increase to the decision by many hospitals to compound hazardous medicines, parenteral infusions, and ophthalmic preparations on site. This shows that HPDs are constantly adapting to the changing needs of their hospitals and their patients[3].

It is undeniable that healthcare is moving towards an increasingly personalized medicine, which also requires a more personalized drug therapy. The advent of new drugs and routes of administration, more advanced therapies, new pharmacological vectors, more complex regimens, and stricter handling requirements is causing a veritable structural and technological upheaval in the compounding units of HPDs.

This was already mentioned in the *Drug Compounding Guidelines for Hospital Pharmacy Departments*, which discussed the difficulties and challenges faced by HPDs and provides new perspectives on the physical, technological, educational, and organizational models required to adapt to the patients' needs and to the demands of society. *The goal is to contribute to a more efficient use of hospital-based medicines. Rational use and efficiency are closely connected and bring about therapeutic benefits for patients, economies for the health system and, last but not least, prevent large amounts of medicines from degrading the environment*[4].

A systematic approach to drug compounding should be based on a profound understanding of the drug in question and of patients' needs. This makes it possible to design more appropriate compounding processes and evaluate the risks associated to them. The complexity and variability of the compounding activity could result in drug administration errors. Domestic and international organizations have spearheaded strategies that have been shown to reduce the incidence of errors: the development of procedures and standards, training professionals in the preparation and administration of injectable drugs, centralized compounding of these injectable infusions in HPDs, setting up multidisciplinary teams that include clinical pharmacists, and upgrading infusion devices using cutting-edge technologies[5].

The technological solutions introduced into the area of medicines utilization have focused in the last few decades on the prescription, dispensing and administration processes. However, compounding is gaining momentum as an area of concern both for hospital pharmacists and for technological solution providers. New technologies for compounding intravenous infusions range from simple tools for calculating concentrations, barcodes, precision scales, image recognition cameras and volumetric dosing pumps to sophisticated robots aimed at eliminating many of the steps involved in drug compounding. A group of Spanish pharmacists is working on the development of one such robotic solution[6].

A good strategy to optimize the compounding process would also be to include the risk associated to the different preparations into hospitals'

electronic prescription and administration systems and to ensure that centralized compounding is used in all high or medium risk cases. This will require improving our information systems and creating automatic classification algorithms based on parameters such as route of administration, inherent risk of the drug, handling complexity, prescription frequency, and place of administration (in a hospital, in other health centers or at the patient's home).

Technology is key to find a solution leading to "zero errors" but that goal requires hospitals to understand the technology used, how it works, and the errors it seeks to prevent. They must also have an understanding of how the technology is likely to change clinical processes[7].

However, these strategies, though available, are not always implemented it hospitals, which is often due to the so-called *knowing-doing gap* resulting from the slow inclusion of evidence-based solutions that have shown to be effective in clinical practice (WHO)[8].

Technology is a driver for change. But people are more important than technology.

Those involved in the process leading to the design of strategies to improve patient safety must fully understand the nature of the changes required and work in close collaboration with leaders, managers, healthcare providers and patients to achieve optimal results.

This endeavor requires the participation of patient safety leaders who are convinced of the need to achieve "zero errors," who are well-trained and motivated to create the organizational and team-based culture and conditions necessary to increase patient safety, guarantee that all systems and procedures comply with the highest standards, and guide and motivate the staff involved. What is needed is a culture dedicated to promoting patient safety where professionals act in a diligent way, utilizing and analyzing errors in such a way that all of us are prompted to change the way we do things, imagine alternative processes, and learn to change.

The future should be built on our efforts to add value to our organizations and our patients. We should all be aware that implementation of centralized intravenous infusion compounding units that address patients' and healthcare providers' needs in an effective and sustainable way is likely to hugely increase the potential of HPDs, provide an enormous clinical benefit to patients, and sharply boost the cost-effectiveness ratio of pharmacological procedures.

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