Case study

Inadvertent intravenous administration of an oral preparation of Ibuprofen

Abstract:

The inadvertent intravenous administration of oral suspension which is rarely reported has contributed to potential patient harm. We received an incident report in which a patient had received an oral liquid formulation intravenously. This has been happening when an oral liquid is prepared or dispensed in a parenteral syringe. Due to the break-in mental concentration, the medicine had been administered intravenously. Some health professionals did not accept the fact that the Luer connection on an intravenous syringe facilitates mis-administration. This is why we constantly repeat recommendations to dispense and administer unit doses of oral liquids in particular oral syringes. We strongly support that, the dispensing and administering of commercially available and compounded medicine in a particular cup and oral syringes or any other suitable containers. In order to avoid such medication administration error ensure the availability of oral syringes in the hospital and patient areas where liquid doses are administered orally.

Oral syringes are not available in Pakistan and nurses routinely use injection syringes for oral liquid administration, as it helps in preventing spill of dose especially in young/non-cooperative children or patients. Availability of oral syringes in the hospital may reduce the inadvertent administration of medicine.

Keywords Administration, ibuprofen**,** inadvertent, intravenous, oral preparation wrong route, Medication safety, oral syringe.

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Introduction:

Medication errors most commonly occur in hospitalized patients that can lead to severe, but preventable iatrogenic harm[i]. In the pediatric population, the medication error rates different considerably among studies[ii]. Maximum drug dosing in pediatric population is weight-based and improper dose calculation and dilution can increase the risk of medication errors in hospitals[iii]. In recent a retrospective analysis, the most commonly reported medication error was an administration of an inappropriate dose and route. Medication errors can be due to either single or multiple factors[iv,v]. A systemic approach reduce medication errors including adopting technology, pharmacist's participation on rounds[vi], standardizing processes, having easy access to patient information, and implementing methods to improve reporting of errors[vii]. These processes also take time to completely implement. In addition, there are limited randomized controlled trials identifying clearly the most effective tool (technology) or approach (pharmacist on rounds) that guarantees success[viii]. Unfortunately, because of these barriers, a limited number of hospitals nationally have implemented a systems approach to reduce medication errors[ix]. Reduce medication errors by utilizing technology tools and a more

efficient and standardized medication use system. The medication errors are complex enough to be completely prevented by only utilizing technological tools[x].

As compared to an adult, the pediatric population has different requirements for oral drug delivery due to their continuing development such as anatomically, physiologically, and psychologically, which influence the approach to the administration of medicines. Conventional formulations are not always appropriate for all pediatric patient groups leading to dose manipulating and compounding of commercial products[xi]. Thus, specifically formulated oral drug formulation will provide a flexible dose and individualized dose requirement across all age groups[xii].

Multiparticulate dosage forms, such as pellets, granules, and sprinkles are comprising multiple units. Multiparticulate dosage forms were introduced in the 1940s and now more than 65 products are available in the united states for pediatric patients and are known to improve patient compliance[xiii]. Due to their small size Multiparticulate dosage forms provide many advantages over single-unit systems. As a single unit containing a small amount of drug[xiv]. The recommended dose can be prepared using a counting device (e.g tablet counter)or measuring a given weight/volume(e.g syringe or dropper). For these reasons, Multiparticulate dosage forms offer a viable alternative to conventional liquid formulations for children[xv]. These simple changes include reporting medication errors minimizing distraction during the medication dispensing/administration process, implementing safe double checks of medications before dispensing/ administration, and creating a culture of safety.[xvi]

Medication errors are more commonly accounted for more serious injuries and motility rates compared to other types of medical errors. Due to limited studies, these types of errors are most prevalent than reported.[xvii] Since sepsis and thrombosis may be fatal consequences of such medication errors. Thus they are responsible for serious patient safety issues.[xviii] According to the America Institute of safe medication practice," parenteral syringes should never be used for oral or oral medicine, rather an oral syringe should always be used[xix]. Given the lack of reported cases, as far as we know, we clarify the issue of accidental intravenous administration of ibuprofen suspension[xx].

Case presentation:

We report a 4 years old female patient admitted to the hospital with bacterial meningitis. There was an inadvertent intravenous administration of oral Ibuprofen suspension 7.5ml (300mg) through a peripheral intravenous line.

Immediately after administration, she became unconscious for 2 to 3 minutes followed by spontaneous recovery. Her heart rate and breathing remained stable throughout. She remained irritable for some time.

No local reaction occurred at the injection site, but as a precautionary measure, the cannula was removed. No specific treatment was given to the patient except for intravenous fluid from a different cannula site. She was immediately shifted to the pediatric intensive care unit (PICU) of the hospital for close observation and monitoring purposes. The family was informed and counseled about the incident and the need for close observation. The patient was

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observed for 48 hours in PICU where she remained stable throughout.
At the time of the incident, she was on Meropenem, Vancomycin, Phenytoin, and Levetiracetam. The patient remained stable and was discharged on the 4th day of the event.
Weekly followup was taken over phone for the next 3 months. And patient also visited the physician for general follow up. Patient did not develop any complication and she was in good state of health.

Discussion:
Very limited published reports about inadvertent intravenous administration of oral (non-sterile) suspension in healthcare settings are available. Nevertheless, there have been documented reports of intravenous drug users injecting methadone liquid and acetaminophen syrup. The most common concerns were thrombosis due to the viscosity of the syrup, and infection, including abscess at the injection site (due to non-sterile product).

In our case, the steps involved in error were: Nurse drew the oral suspension from the bottle according to the dose (7.5ml) in a syringe for oral administration. She handed it over to the nursing assistant (NA) for administration. NA did not realize that this is for oral administration and instead it was given through IV cannula. The syringe used for administration was a disposable type injection syringe (and not an oral syringe). Oral syringes are not available in Pakistan and nurses routinely use injection syringes for oral liquid administration, as it helps in preventing spill of dose especially in young/non-cooperative children or patients.

It is interesting to note that there are reported incidents in literature where despite using oral syringes which do not fit with IV cannula, staff has managed to push through intravenously medication with some leakage. We feel that steps need to be taken to modify the protocols for use of oral syringes including modification of the color, design, and labeling of these syringes. Moreover, the availability of oral syringes in the hospital environment needs to be ensured to avoid such type errors.

Conclusion:
Inadvertent administration of oral preparation of a commonly used medication is a rare but serious event can result in increased length of stay , healthcare expenditure, and complications. We report this case to raise awareness among healthcare professionals, especially nurses and doctors.

Ethical Approval:
As per international standard or university standard ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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