Evaluation of the Timing of Opioid Administration: A Pilot Study

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Objective: Approximately 20% of the errors committed at hospitals are attributed to medication error, which is one of the main things threatening the safety of patients. Every hospital has a list of medications that are considered time-critical scheduled medications. Opioids with a specific schedule of administration are included on these lists. These medications are used to treat patients with chronic or acute pain. Any variation in the established schedule can cause undesired effects in patients. The objective of this study was to assess the compliance rate of opioid administration; that is, determine whether these medications were being administered within the appropriate window (30 minutes on either side of the scheduled time).

Methods: The data were collected by reviewing the handwritten medical records of all the hospitalized patients who received time-critical opioids from August 2020 through May 2021 at a specialty cancer hospital.

Results: In total, 63 interventions were evaluated. Of the 10 months included in the analysis, the percentage of administration required by the institution and accrediting agencies (95%) was met in 3. September was the month with the lowest rate of compliance, this being 57%.

Conclusion: The study demonstrated low compliance in terms of the administration time of scheduled opioids. These data will help the hospital institution to find areas that can be improved to achieve better accuracy in the administration of this category of drugs. [*P R Health Sci J 2023;42(1):77-80*]

Key words: Opioids, Administration error, Medication error, Time-critical, Wrong time

Every hospital has a list of medications that are considered time-critical scheduled medications. The opioids with established administration schedules are included on these lists; those prescribed as needed (PRN) were excluded from our study. Drugs with time-specific requirements need to be administered no more than 30 minutes before or after (1-hour range) the scheduled time to fulfill the intended therapeutic or pharmacological effect. These medications are used to treat patients with chronic or acute pain. Therefore, their administration outside of the appropriate time frame may cause unnecessary suffering to the patients in the event that administration is delayed or death in case of overdosing (1).

Approximately 20% of the errors committed at hospitals are attributable to medication error, which is one of the main risks threatening the safety of patients (2). Hospital institutions are regulated, voluntarily, by accrediting agencies that require them to comply with specific standards to guarantee their patients' safety and the efficacy of their treatments. However, they have had to deal with certain institutional factors that lead to medication error, especially the administration time (3). One study reported that opioid errors constituted 32% of all reported medication errors, and of this 32%, 76% were administration errors (4).

Failing to comply with the requirements of time-critical scheduled medications is considered a medication error. While the literature contains assessments of drugs that have critical administration criteria, there is little published data covering drugs used to treat pain in and as palliative care for cancer patients (e.g., opioids) (3). Studies have shown low incidences of medication error at hospitals that use electronic record-keeping systems. However, other reports show there to be low incidences of medication error, even with opioids, in those clinical settings in which paper-based systems are used (4). This apparent contraindication should be the subject of future studies to confirm this observation.

The purpose of this study was to determine (via the handwritten medical records of patients hospitalized from August 2020 through May 2021) whether the nursing staff of the home institution was meeting the 95% level of compliance that is required by the

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said institution and the appropriate accrediting agencies for the administration of time-critical opioids. The objective was to assess the level of compliance with regard to the administration time of opioids (i.e., that such administration was taking place within the established administration time window, which ranges from 30 minutes before to 30 minutes after the scheduled time).

Methods

This was a descriptive, retrospective pilot study. The study enrolled all the oncology patients who received time-critical opioids from August 2020 through May 2021 at the Comprehensive Cancer Center Hospital of Puerto Rico, which is a specialty cancer hospital. Medical records from only the indicated 10 months were evaluated since it was a study designed to be carried out in a short period to assess the effectiveness of administering these medications before the institution transitions to an electronic medical-record system. The existing handwritten medical records of all the potential subjects were evaluated in order to identify those who were eligible for this study. The inclusion criteria consisted of patients that met the criteria of being at least 21 years old and hospitalized patients who were ordered to administer opioids within the strict 1-hour time window of the scheduled during 10 months period time. Patients excluded from participating were those who had been prescribed opioids as needed (PRN), those who were incarcerated, and those who were pregnant (the final 2 because the hospital did not, at that time, have any patients meeting those criteria). In addition, dose omissions or administrations outside the stipulated time but were duly justified by the pertinent health professional were excluded.

For data-collection purposes, a monitoring sheet that collected such necessary information as the record number of the patient, the name of the opioid administered, and whether said opioid was administered within the established period of time was utilized. In addition, the dose administered, the exact date and time of its administration, the unit where it was administered, the name of the nurse who administered the drug, and the reason for the delay or dose omission, when applicable, were registered. The different opioids commonly administered for pain management in the hospital institution were observed and recorded. The study was approved by the Comprehensive Cancer Center–University of Puerto Rico Institutional Review Board (IRB). A statistical analysis was conducted to describe the characteristics of the population. A percentage was used to measure compliance in administering the time-critical opioids, which compliance should be 95%, as required by the accrediting agencies.

Results

A total of 477 handwritten medical records were evaluated. Of these, 63 described instances of medication administration that consisted of time-critical opioids, with the patients who received these doses meeting the inclusion criteria. Each of the 63 had received 1 or more doses of a time-critical opioid. It has been observed that the opioid that doctors commonly order (and this is true at the Comprehensive Cancer Center Hospital of Puerto Rico) for pain management in cancer patients is fentanyl in a patch formulation. Other administered opioids include Percocet, MS Contin, hydromorphone, morphine, Ultram, and oxycodone. Figure 1 shows the different drugs administered (with their administration percentages) during the study period.

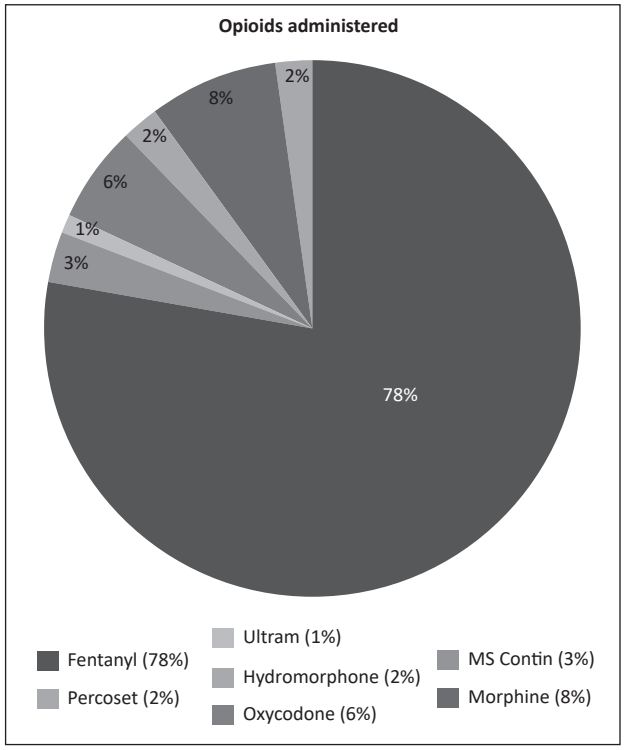

Figure 1. Opioids administered (as a percent of the total) during the study.

Figure 2 shows compliance (per month) with medication administration protocols. These vary from 57% to 100% compliance. In August (2020), 22 doses of time-critical scheduled opioids were ordered, of which 19 doses were appropriately administered, for an 86% compliance rate. During the month of September, 7 doses were ordered, of which 4 were correctly administered (57%). In October, out of a total of 12 doses ordered, 11 correct doses were administered (92%). In November, 15 of 16 total doses ordered were administered correctly (94%). In December, 19 doses were ordered and 13 were administered correctly (68%). For the month of January, 23 doses were ordered, of which 21 doses were administered correctly (91%). In February, there was 100% compliance (11/11), as was the case for the months of April (2/2) and May (2/2). During the month of March, 17 doses were ordered; however, only 13 of them were appropriately administered (76%). In 3 of the 10 months included in the analysis (February, March, and April of 2021), the rate of successful administration required (95%) by the institution and the accrediting agencies was met or exceeded. The month of September was the month with the lowest rate in compliance, this being 57%.

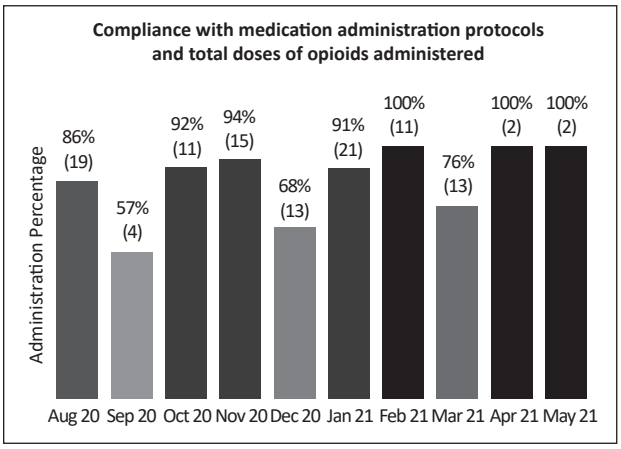

Figure 2. Percentage of compliance and total doses of opioids administered monthly.

Nurses had no apparent explanations for 47% of the errors in administering time-critical medications, whether those errors were in the form of omissions or untimely delivery; that is, the reasons that medications were administered outside the required 60-minute window were—for the most part—not reported or documented. However, the most relevant justifications for untimely dosing were that the medical order had been discontinued (17%), a new medical order had been made (12%), and the patient had been discharged (12%) (Figure 3).

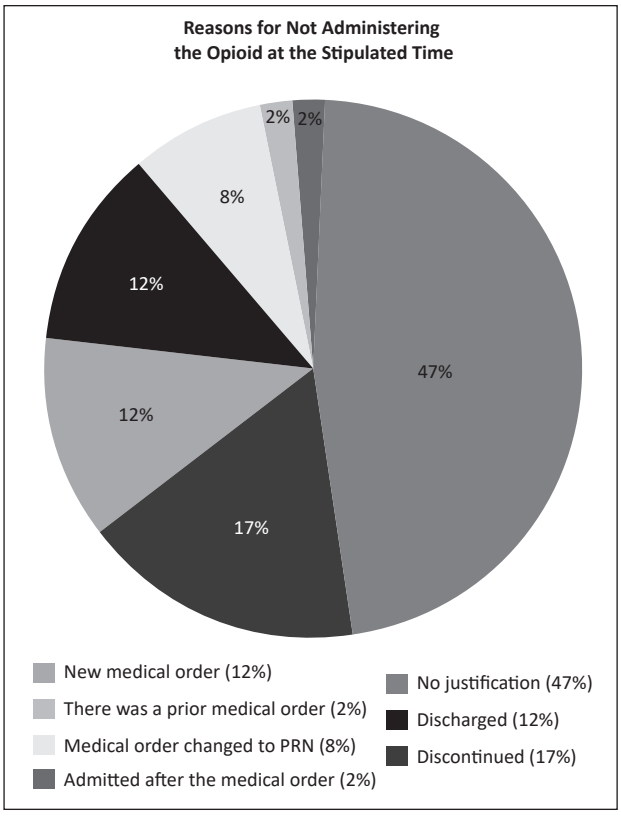

Figure 3. Reasons for dose omissions and wrong-time administration

Discussion

This study determined that the institution was not meeting the rate of successful administration (95%) that is required for time-critical opioids. Discrepancies in the documented administration schedules were observed during the study, in that 15% (20) of the time, a medication was administered earlier than scheduled, a dose was omitted, or a delay that was not explained occurred. Since the schedules were handwritten documents, the discrepancies may have been due to human error. According to the literature, this kind of error may be due to the presence of a large number of patients in the care area, an area in which there might be a limited number of nurses on duty (not enough staff) (5), changes in administration times, competing clinical priorities, and patient movements within the hospital (3). These factors can result in errors that can compromise the improvement of the patient and even lead to critical conditions.

Another factor that theoretically could influence the optimization of the administration of medication on time is the use of electronic medical records (EMRs) and an automated medication-dispensing system. These are tools for administering medications that hospital institutions can use in order to address low compliance and obtain better health outcomes. Furnish et al. evaluated 69,794 instances of medication administration, and of the 389 time-critical scheduled medications that were administered, 268 (69%) were administered on time (3). The institution with which Furnish and his team were affiliated had an automated medication-dispensing system and used EMRs; their study does not report the percentage of compliance specifically with opioids.

Another study related to medication administration time errors (including opioids) comes from Calabrese et al. Of the 187 errors detected in an adult intensive care unit, this team found the most common to be the untimely administration of medication and dose omission (13.9% and 27%, respectively) (6). In the pediatric intensive care unit of another hospital, Buckley et al. determined that 26.7% of the administration errors concerned doses that were dispensed at the wrong time and 0% were dose omissions (7). This team reported that the administration errors, which included giving the wrong dose, using the wrong technique to give the dose, giving an extra dose, and giving the dose at the wrong time, were caused by slips and memory lapses (46.7%), lack of drug knowledge (13.3%), and rule violations (13.3%). Neither institution (that of Calabrese et al. and that of Buckley et al.) had EMRs.

In other institutions, relevant errors are also observed in the administration of medications, even in those with or without EMRs (4). We found that having an EMR system did not guarantee the elimination of errors in the administration of medication. The data for our study were collected using existing handwritten medical records, which is a limitation. The health professional has a possibility of errors regarding the documentation of the tasks in these records. This variation can limit the accuracy of the data. In addition, the data collected and analyzed belong to the months of August 2020 through

May 2021, so the sample was relatively small and therefore not representative of the entire population.

Although there are limitations in this study, the evaluation of these data will help the hospital institution improve its quality of work and achieve accuracy in administering medications that must be dispensed within specific time ranges, especially opioids. This error can be significant when it occurs in cancer patients who are taking opioids for their pain. The administration of opioids outside the indicated window of time may negatively affect the patient's health and safety, including subjecting them to excessive sedation, which can lead to respiratory depression, uncontrolled pain, or other complications.

The institution should educate health professionals, and the institution should encourage each one to educate him- or herself about the importance of these drugs in controlling pain and the adverse effects that their administration outside of scheduled times may cause. In addition, it is important to be aware of and follow the regulations stipulated by each institution and agency, both of which make their recommendations based on scientific evidence and are committed to guaranteeing the effectiveness of the treatments and the safety of each patient. The goal of the Comprehensive Cancer Center Hospital is to reach the medication administration compliance rate of 95% for drugs that are considered to be time critical. Doing so will ensure that patients are exposed to a process that is safe, effective, and efficient. The meeting of this goal will allow the institution to comply with the standards established by the accrediting agencies, the Centers for Medicare & Medicaid Services and the Institute for Safe Medication Practices. Future work may consist of evaluating and comparing the administration of this category of medications after EMR integration in the institution and the optimization of treatment outcomes.

Conclusion

The data indicating the institution's low compliance that were obtained in the study will help the hospital work towards and find different strategies to improve its quality of work and achieve better accuracy in administering those drugs that have a critical time range. The administration of drugs within the acceptable time range will positively impact patients by helping to prevent adverse events associated with medication errors and improving quality of life.

Resumen

Objetivo: Aproximadamente el 20% de los errores cometidos en los hospitales se atribuyen a errores de medicación, siendo uno de los principales tipos de eventos que amenaza la seguridad de los pacientes. Todos los hospitales tienen una lista de medicamentos que se consideran medicación programada crítica. Los opioides con horario de administración programado están incluidos en estas listas. Estos medicamentos se utilizan para tratar pacientes con dolor crónico o agudo. Cualquier variación en el horario establecido para su administración puede provocar efectos no deseados en los pacientes. El objetivo de este estudio fue evaluar el porcentaje de cumplimiento en la administración de opioides dentro de la ventana de tiempo establecida de 30 minutos antes o después del horario programado. Métodos: Los datos se recopilaron revisando los expedientes médicos físicos de todos los pacientes hospitalizados que recibieron opioides categorizados como *medicación programada crítica* desde agosto de 2020 hasta mayo de 2021 en un hospital especializado en cáncer. Resultados: En total se evaluaron 63 intervenciones. De los diez meses incluidos en el análisis, en tres de ellos se cumplió con el porcentaje de administración requerido por la institución y agencias acreditadoras (95%). El mes de septiembre fue el mes con menor porcentaje de cumplimiento, siendo este 57%. Conclusión: El estudio demostró un pobre cumplimiento con el tiempo de administración de opioides categorizados como *medicación programada crítica*. Estos datos ayudarán a la institución hospitalaria a evaluar áreas de mejora para lograr una mayor precisión en la administración de esta categoría de medicamentos.

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References

1. Det Norske Veritas. NIAHO® Accreditation Requirements, Interpretive Guidelines and Surveyor Guidance. DNV Healthcare USA Inc. 2005. Accessed June 2, 2021. https://www.dnv.us/assurance/healthcare/standards/niaho-ac-dl.html
2. Heneka N, Shaw T, Rowett D, Phillips JL. Quantifying the burden of opioid medication errors in adult oncology and palliative care settings: A systematic review. Palliat Med. 2016;30(6):520-532. doi:10.1177/0269216315615002
3. Furnish C, Wagner S, Dangler A, et al. Evaluation of Medication Administration Timing-Are We Meeting Our Goals? J Pharm Pract. 2021;34(5):750-754. doi:10.1177/0897190020905456
4. Heneka N, Shaw T, Rowett D, Lapkin S, Phillips JL. Opioid errors in inpatient palliative care services: a retrospective review. BMJ Support Palliat Care. 2018;8(2):175-179. doi:10.1136/bmjspcare-2017-001417
5. Nagar S, Davey N. Reducing avoidable time delays in immediate medication administration - learning from a failed intervention. BMJ Qual Improv Rep. 2015;4(1):u206468.w2612. Published 2015 Feb 11. doi:10.1136/bmjquality.u206468.w2612
6. Calabrese AD, Erstad BL, Brandl K, Barletta JF, Kane SL, Sherman DS. Medication administration errors in adult patients in the ICU. Intensive Care Med. 2001;27(10):1592-1598. doi:10.1007/s001340101065
7. Buckley MS, Erstad BL, Kopp BJ, Theodorou AA, Priestley G. Direct observation approach for detecting medication errors and adverse drug events in a pediatric intensive care unit. Pediatr Crit Care Med. 2007;8(2):145-152. doi: 10.1097/01.PCC.0000257038.39434.04