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Safety/QA/QI Projects

Can Actual Administration of Prescribed Acetaminophen Be Used As A Pain Management Quality Improvement Measure

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Introduction

Acetaminophen is a well-known analgesic used to treat moderate post-surgical pain. The drug is opioid sparing, a strategy which is incredibly useful in combating the ongoing opioid crisis in the US. As of March 2021, over 841,000 deaths have been attributed to drug overdose since 1999, over 70% of which have involved any opioid, including prescription and illegal use (1). This number has increased from just under 10,000 deaths in 1999, to 49,850 reported in 2019, a nearly 400% increase and rising (1, 2). Acetaminophen should be prescribed in conjunction with opioids as part of a multimodal analgesia plan aiming to reduce total opioid consumption. A number of patients will not have acetaminophen prescribed, but even if the drug is prescribed, the question remains, how often is it actually given? Can the acetaminophen prescribing rate and number of completed doses after surgery be used as a quality improvement measure to identify if tertiary care centers are effectively utilizing this medication to the fullest extent? This QI project investigated the overall acetaminophen prescription rate, and aimed to discover if there is variation in prescribing habits by various surgical services, with the goal of bettering post surgical analgesia, reducing opioid related side effects, and improving post-surgical outcomes for patients at risk for substance use disorders.

Materials and Methods

Results were obtained through a retrospective data extraction from an electronic medical record describing post-surgical acetaminophen prescriptions at a university medical center during the month of March 2021. Data from 1529 individuals receiving postoperative acetaminophen from various surgical services were identified by non-identifiable Hospital Encounter ID. Analysis consisted of a stratification by surgeon and service, and average prescription was identified for each, as well as across services. Other notable patterns were identified as well, such as age of patient, time spent in hospital care by dose, and percentage of scheduled versus "PRN" prescriptions. This data is presented as a QI project, thus no IRB/IND approval was required.

Results/Case Report

Analysis of the medical record reveals that the hospital-wide average post-surgical acetaminophen prescription falls at 3059.615 mg, roughly $\frac{3}{4}$ of the maximum recommended dose. Of this, 43.5% are prescribed as needed (PRN). Variation in both dosage and method of administration (intravenous and

oral) was found based on surgeon and surgical service as listed in Table 1.

In the neurosurgery and cardiac surgery departments, daily doses varied between individual surgeons by as much as 1200 mg and 1000 mg respectively, for the same surgical procedures. Surgical oncology, thoracic, and trauma all showed similar themes. Prescription patterns were also shown to vary by service. Many services were not utilizing acetaminophen postoperatively at all – 10.54% of all surgical patients had surgery but not acetaminophen, with 20.24% of burn and 15.69% of vascular surgeries not using acetaminophen for postoperative pain relief. While not a significant sample size, nearly 50% of pulmonary cases did not use acetaminophen, indicating room for improvement. Oral/Maxillofacial and plastic surgery cases frequented acetaminophen use, both using in 92.31% of cases. Of the services that prescribe acetaminophen frequently, cardiac surgery was shown to get closest to the maximum dose on average (3530.24 mg), followed by thoracic surgery (3268.85 mg). ENT, plastics, and vascular surgery were not far behind, with values above 3000mg. Neurosurgery and oral/maxillofacial prescribed the lowest doses on average, at 2673.33 mg and 2640.29 mg respectively. With acetaminophen type, most preferred oral, but preference was shown for intravenous administration in gastrointestinal and surgical oncology cases (~60% intravenous for both), whereas plastics and transplant relied more heavily on oral administration (~80%). Gynecology oncology exclusively used oral administration. Looking at scheduled and 'PRN' (as needed) dosing, transplant and plastics leaned more heavily towards PRN, with transplant being over 80% as needed. Gastrointestinal, surgical oncology, and thoracic surgeons prescribed scheduled acetaminophen in over 70% of cases. Some specialties were excluded from analysis given that not enough data values were compiled for an adequate sample size.

Discussion

From this data, it can be inferred that there is room for improvement in acetaminophen prescriptions within our own hospital, and presumably nationwide. We aim to share this data with surgical services which may help to provide training/education for colleagues and providers about current prescription habits to increase awareness of this need and influence future prescriptions. After seeing this significant variation in prescription habits across both services and surgeons, the next step would be to standardize order sets to provide a consistent, safe, and more efficient way of prescribing acetaminophen. Simple revisions of order sets and physician education is essential to achieve minimization of 'PRN' prescriptions, for example. Further, standardization can ensure value-based care, as IV acetaminophen is expensive and can easily be substituted with oral at near equal effectiveness. Reducing variation and increasing average acetaminophen prescriptions, primarily in fields where this tool is not as often used (e.g. burn and vascular), may also shrink the need for habit-forming drugs in the treatment of moderate post-surgical pain, which often provide a gateway to continually using illicit opioids. By even slightly reducing the in-hospital consumption of opioids, the death toll, as well as the economic burden of the opioid epidemic (estimated at 1.021 trillion in 2017) may be lessened as a result (3).

Acetaminophen has potential, but it's not to be used without caution. While opioids have complications of their own, acetaminophen and other NSAIDs have been associated with hepatotoxicity in the literature, though further studies are needed to determine causality (4). Previous liver damage or failure may be a contraindication to use. Despite this, prescribing acetaminophen at the maximum dose has not been shown to induce long-term liver injury in literature. Further, most cases of overdose occur through over-the-counter use, and standardized order sets can help to prescribe acetaminophen safely to patients.

Looking at the data presented, there is an opportunity to improve upon moderate post-surgical pain

management. Substituting a portion of prescription opioids with acetaminophen to treat moderate post-surgical pain in a tertiary care setting may have the potential to create safer and more consistent prescription habits and to mitigate the current opioid crisis.

References

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Disclosures

No

Tables / Images

Table 1: Variation in acetaminophen prescriptions emphasizes need for standardization

	Avg discrete dose	Avg daily dose	Proportion of Oral (versus Intravenous)	Proportion of scheduled (versus PRN)
Cardiac	830.6452 mg	3530.2419 mg	0.65	0.575
GI	939.1304 mg	2979.8353 mg	0.347826087	0.823529412
Gynecology oncology	688.8889 mg	2985.1622 mg	1	0.555555556
Neurosurgery	843.9024 mg	2673.3281 mg	0.707317073	0.65625
Oral Maxillofacial	784.0909 mg	2640.2946 mg	0.454545455	0.5
Plastics	825 mg	3134.375 mg	0.833333333	0.375
Surgical oncology	950 mg	3022.1333 mg	0.428571429	0.714285714
Thoracic	904.8387 mg	3268.85 mg	0.548387097	0.708333333
Transplant	830.35715 mg	2860.17045 mg	0.857142857	0.181818182

Not included in table: Pulmonary, Reproductive Endocrinology, Dentistry, Pediatrics, Urology, Women's Primary Gynecology, Orthopedics, Burn, Trauma, ENT, and Vascular