MEDICATION SHORTAGES: IMPACT ON ERRORS

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- I am Chair Probable Cause Panel, Florida Board of Pharmacy

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- iCARE Pharmacy Services, Inc. is accredited by the Accreditation Council for Pharmacy Education (ACPE) as a provider for continuing pharmacy education.
- **This activity offers 1.5 contact hours (0.15 CEU).**
- • Target Audience: Pharmacists and Registered Pharmacy Technicians
- • ACPE #: 0675-0000-24-014-L05
- • Activity Type:
    - Knowledge based

LECTURE OBJECTIVES

- Identify root causes of current Medication Shortages and why our current situation is recognized as the most severe in history
- Review most recent near miss and medication errors reported related to/associated with medication shortages
- Discuss the RaDonda Vaught vecuronium administration error in place of midazolam resulting in patient death unintentional error, which resulted in criminal negligence in Tennessee and turned the medical world upside-down

DRUG SHORTAGES: ROOT CAUSES AND POTENTIAL SOLUTIONS-EXECUTIVE SUMMARY - FDA 2018

Drug Shortages Pervade Many Aspects of Patient Care

Shortages can worsen patients' health outcomes by causing delays in treatment or changes in treatment regimens, such as substituting less effective therapies, when a drug of choice is not available. Even when alternatives to the preferred drug are available, a patient's care may be compromised. According to a recent study, 56 percent of hospitals reported they had changed patient care or delayed therapy in light of drug shortages; 36.6 percent said they had rescheduled non-urgent or emergent procedures.

SPECIFIC PATIENT AREAS OF IMPACT- 2018

Childhood Cancer

Drug shortages can have a drastic impact on the most vulnerable patients. An estimated 90 percent of the 3,000 children afflicted with T-cell acute lymphoblastic leukemia (ALL) are curable (5-year event-free survival). However, many of the drugs used to treat children with ALL (the most common childhood cancer) are older drugs, potentially making them more vulnerable to shortage. From 2009-2019, 9 of the 11 drugs used to treat ALL were in and out of shortage. Despite recent evidence that adding nelarabine to children's treatment regimens improves survival rates and is thus becoming the new standard of care, nelarabine has been in shortage recently, causing much anguish and grief for patients, parents, and clinicians.

Septic Shock

A shortage of norepinephrine in 2011 led to some patients with septic shock being treated with alternative drugs. When patients with septic shock were admitted to hospitals experiencing the shortage, they were more likely to die than at hospitals not experiencing the shortage.

ADDITIONAL AREAS OF IMPACT- 2018

Palliative Care

Bleomycin is used for palliative treatment of a number of forms of cancer including Hodgkin and non-Hodgkin lymphoma. In 2016, a severe shortage of bleomycin led to use of alternative treatment regimens. Although just as effective, the alternatives require inpatient stay, increasing stress for patients and families, potentially exposing patients to pathogens in the hospital environment, and substantially increasing costs.

Anesthesia and Sedation

Drug omissions due to shortages negatively impact patient care and the patient experience. Lidocaine is used to diminish the burning sensation often associated with propofol, a common anesthetic. The American Association of Nurse Anesthetists reports that a lidocaine shortage has resulted in patients who receive propofol feeling a burn on induction, leading to agitation at precisely the time a patient should be relaxed and without stress as they undergo sedation or anesthesia.

TASK FORCE ON DRUG SHORTAGES- 2018

- Bipartisan request- 31 US Senators and 104 members of the House of Representatives wrote to the then commissioner of the FDA, Scott Gottlieb, MD, asking for assistance in addressing the Nation's Drug Crisis.
- Analysis presented by the FDA at the November meeting demonstrated that drug shortages have been increasing after declining from its peak in 2011; in some cases, shortages are lasting more than 8 years
- FDA analyzed a 5-year period (2013-2017); of the 163 drugs ion the sample, 63% (103) were sterile injectables and 67% (109) had a generic version on then market. Most were older drugs with median time of first approval almost 35 years ago. In the year prior to the shortage, the median per unit price was $8.73 for all the shortage drugs; $11.05 for injectables and $2.27 for orally administered.

EPIDEMIOLOGY OF DRUG SHORTAGES- 2018 REPORT

- Lack of incentives for manufacturers to produce less profitable drugs
- Market does not recognize and reward manufacturers for "mature quality systems" that focus on CQI and early detection of supply chain issues
- Logistical and regulatory challenges make it difficult for the market to recover from a disruption
  - **SOLUTIONS:**
- Create a shared understanding of the impact of drug shortages on patients and the contracting practices that may contribute to shortages
  - Quantify Harm, particularly those that lead to worsened health outcomes for patients and increased costs for providers
  - Better characterize shortages: frequency, persistence, intensity
  - Provide greater transparency in pricing

SHORTAGES REPORT CONTINUED

- Develop a rating system to incentivize drug manufacturers to invest in quality management maturity for their facilities

- Promote sustainable private sector contracts (e.g. with payers, purchasers and GPOs) to make sure there is a reliable supply of medically important drugs
  - Provide financial incentives
  - Reward manufacturers for mature quality equipment

Report also described legislative proposals and FDA initiatives

FDA INITIATIVES TO PREVENT/MITIGATE SHORTAGES

- Improve data sharing- FY2020 budget expanded information required to be provided to the FDA about interruptions in manufacturing and authorizes penalties for non-compliance
- Improved data sharing compliance- at the end of calendar year 2019, FDA published guidance for which manufacturers provide additional details so FDA has information it needs to prevent/mitigate shortages.
- Risk management plan requirement-FY2020 budget authorizes agency to require application holders of certain drugs to conduct periodic risk assessments to identify vulnerabilities in their manufacturing supply chain and develop plans to mitigate risks
- Risk management plan guidance-end of 2019, FDQ published "Risk Management Plans to Mitigate Potential for Drug Shortages" which outlines a new recommendation for pharmaceutical stakeholders to develop, implement, and maintain a risk management plan for the purpose of preventing and mitigating drug shortage.

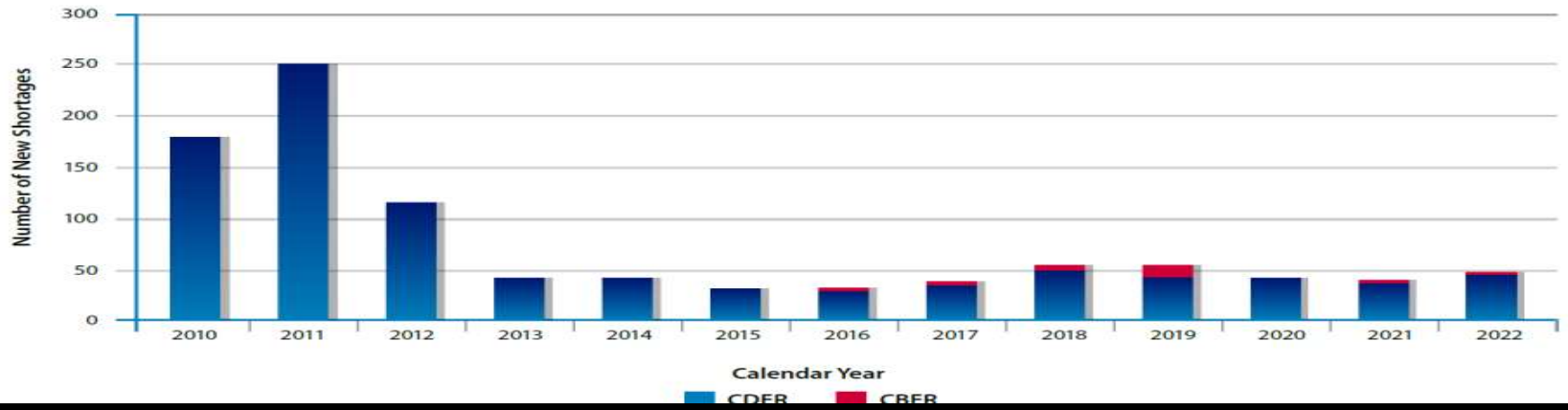
FDA INITIATIVES CONT'D

- Lengthened expiration dates- FY2020 authorize FDA to require, when likely or mitigate a shortage, that an applicant evaluate, submit studies to FDA, and label a product with longest expiration date possible
- Technical and regulatory considerations for pharmaceutical product lifecycle management- The internationally harmonized guideline is under current finalization. It outlines ways to enhance understanding of product and process development and establish an effective pharmaceutical quality system. Adoption of the guidelines includes opportunities for less stringent regulatory oversight and modernization of manufacturing processes.

FDA PUBLISHED AND PRESENTED DRUG SHORTAGES REPORT TO CONGRESS FOR CALENDAR YEAR 2022

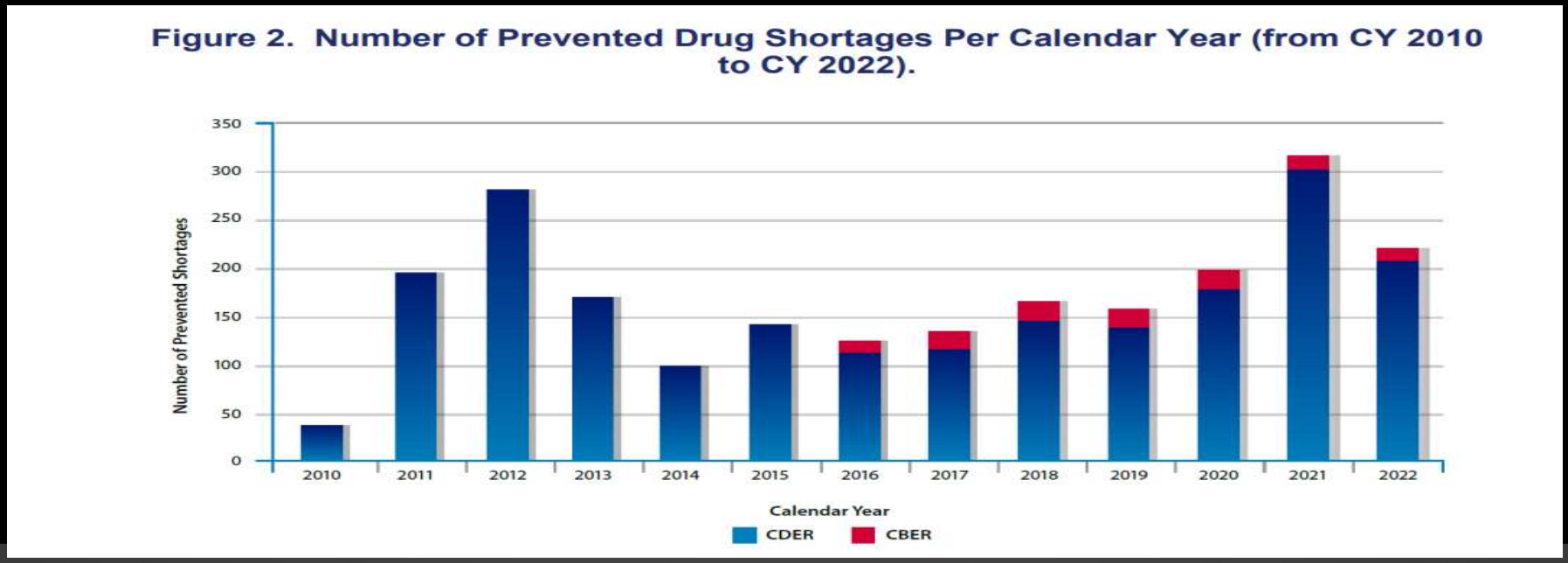
- Like other supply chain disruptions, COVID-19 pandemic impacted and continues to plague medication supplies
- **New** Shortages was tracked at 49 compared to 251 in 2011

Figure 1. Number of New Drug Shortages Per Calendar Year, (from CY 2010 to CY 2022).[3]



PREVENTED DRUG SHORTAGES PER CALENDAR YEAR

- The report discusses that the mitigating strategies implemented from the 2018 Task force was helpful in preventing 222 drug shortages



FDA Drug Shortages Report to Congress 2022

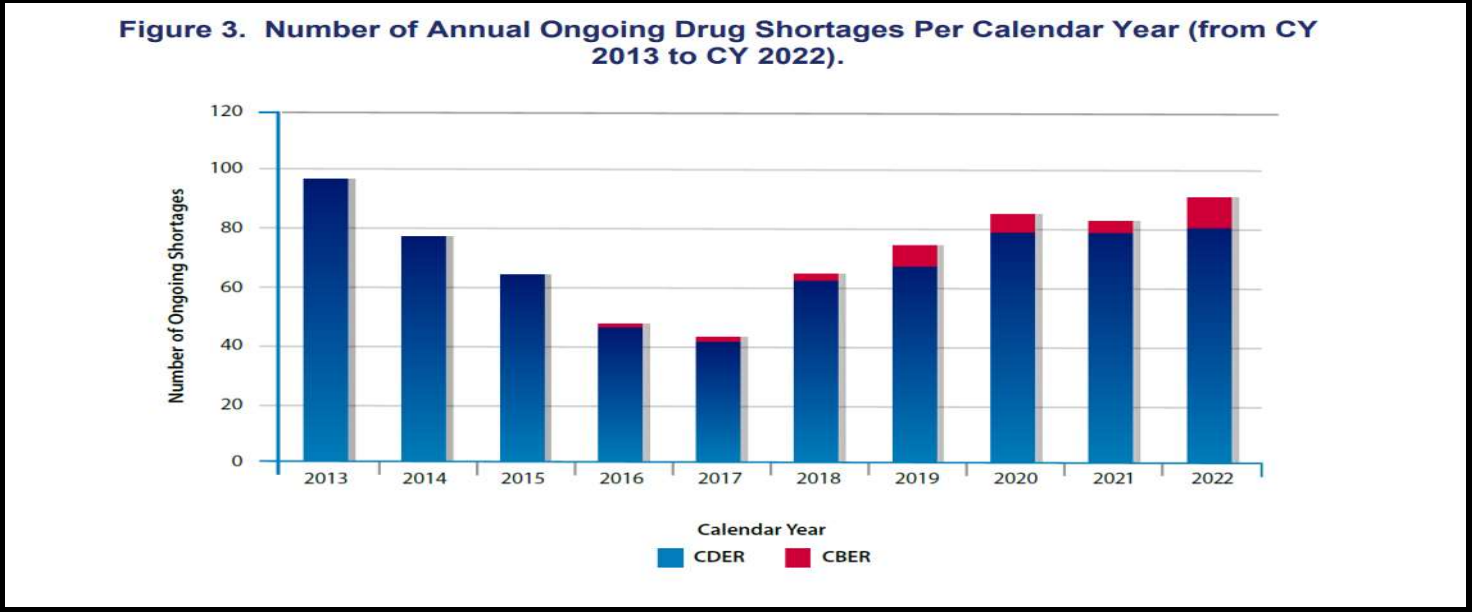
REPORT SUMMARY

- FDA was notified of 777 potential drug and biological product shortage situations by 115 different manufacturers
- Describe communication between FDA and Office of Regulatory Affairs
- Actions taken to prevent/mitigate drug shortages
  - Determine if other manufacturers willing/able to increase production to make up the gap
  - Expedite FDA's inspections and reviews of submissions by affected manufacturers attempting to restore production
  - Expedite FDA's inspections/reviews competing entities interested in starting new production or increasing existing production of products in shortage
  - Expedite release of lots of certain licensed biologics regulated by CBER or CDER
  - Review requests for extensions of expiration dating
  - Exercise temporary regulatory flexibility for new sources of medically necessary drugs
  - Work with affected manufacturers to ensure adequate investigations into the root cause of the shortage
  - Develop risk mitigation measures to allow individual batches of drug product to be released even when quality assurance measures not met

ADDITIONAL DRUG SHORTAGE REDUCTION STRATEGIES BASED ON 2021 REPORT

- Executive order 13588- reducing prescription drug shortages
  - Expedited reviews and advanced notice for potential shortages
- FDA safety and Innovation Act (FDASIA)
  - Requirement to provide advance notice for permanent discontinuation of life-sustaining medications
- The Coronavirus Aid, Relief and Economic Security Act (CARES Act)
  - In addition to the above, requires manufacturers to implement risk management redundancy plans
- The inter-Agency Drug Shortages Task Force
  - Report published 10/2019 however the FDA meets internally to monitor and discuss potential and ongoing shortages

NUMBER OF ONGOING DRUG SHORTAGES/CALENDAR YEAR



FDA Drug Shortages Report to Congress 2022

CDER AND CBER SHORTAGE NUMBERS

Appendix C: Breakdown of CDER's and CBER's Shortage Numbers for CY 2022

	CDER	CBER
NUMBER OF SHORTAGES		
New Shortages	48	1
Prevented Shortages	210	12
Ongoing Shortages	81	5
Notifications	1267	26
Number of Manufacturers Notifying	133	17
ACTIONS TAKEN TO MITIGATE SHORTAGES		
Regulatory Flexibility and Discretion	85	0
Expedited Reviews	193	11*
Expedited Inspections	30	0

* This number includes expedited reviews for six biologics license application (BLA)/BLA supplements and five lot-release submissions for CBER-regulated products.

EXPEDITED REVIEWS

Appendix D: Breakdown of Expedited Reviews in CY 2022 by Submission Type

Submission Type	Expedited Reviews
NDA/NDA Supplements (CDER)	36
ANDA/ANDA Supplements (CDER)	149
BLA/BLA Supplements (CDER)	8
BLA/BLA Supplements (CBER)	6*

* This number does not include the expedited reviews for the five lot-release submissions for CBER-regulated products.

TWENTY DRUGS IN AND OUT OF SHORTAGE SINCE 2015

1. Magnesium sulfate injections have been in shortage since at least May 2015, and as of April 10, 2023, three drugmakers are reporting supply issues with their solutions.

2. Diltiazem hydrochloride injection supply has waned since at least June 2015, and as of April 6, 2023, two drugmakers are experiencing shortages and one now-closed drugmaker, Akorn Operating Co., discontinued its solutions in mid-2022.

3. Vancomycin hydrochloride injections have been in short supply since at least June 2015, and as of April 11, 2023, 12 solutions are in shortage and 33 are available.

4. Leucovorin calcium injections have been in shortage since at least June 2015, and as of April 11, 2023, 15 solutions are unavailable and two products are discontinued.

5. Morphine injections have gone into dearths since at least June 2015, and as of April 10, 2023, 14 solutions are available and 13 solutions are not.

6. Acetylcysteine oral and inhalation solution supplies have been rocky since at least June 2015, and as of March 24, 2023, there is insufficient supply for ordering 10 products.

7. Atropine sulfate injections have been in shortage since at least June 2015, and as of April 10, 2023, manufacturing delays and increased demand have delayed the product's release.

8. Cefotaxime sodium injections have been in shortage since at least June 2015, and as of March 9, 2023, six products are unavailable.

9. Antivenin latrodectus mactans, or black widow spider antivenins, have been in short supply since at least June 2015, and as of January 17, 2023, Merck has low inventory of one solution.

10. Multiple vitamins for infusion, including Infuvite and multivitamins, have been unavailable since at least June 2015. As of March 8, 2023, four solutions are in shortage because of third-party manufacturing delays and three others are discontinued.

ASHP drug supply database updated April 21, 2023

TOP 20 DRUG SHORTAGE SINCE 2015 CONTINUED

11. Levetiracetam injections have been in shortage since at least June 2015, and as of March 9, 2023, two drugmakers have one solution unavailable. Most other drugmakers told ASHP they have usual supply levels.

12. Lidocaine injections have been in a dearth since at least June 2015, and as of April 10, 2023, 44 solutions are in shortage and 12 are available.

13. Lorazepam injections have fallen into shortages since at least June 2015, and as of April 13, 2023, three drugmakers cannot match demand, and Akorn discontinued its products after it ceased operations in February.

14. Clindamycin phosphate injections have been in shortage since at least June 2015, and as of April 10, 2023, there is not enough supply for 21 products.

15. Lidocaine with epinephrine injections have been unavailable since at least June 2015, and as of April 11, 2023, 23 solutions are in shortage.

16. Doxorubicin injections have been in short supply since at least July 2015, and as of April 11, 2023, eight products are unavailable and 12 are available.

17. Ketorolac injections have been in shortage since at least July 2015, and as of March 7, 2023, four drugmakers do not have enough supply for six products and another company discontinued three solutions.

18. Dexamethasone sodium phosphate injections have been unavailable since at least August 2015. As of April 19, 2023, three drugmakers are reporting shortages as 15 solutions are on the market.

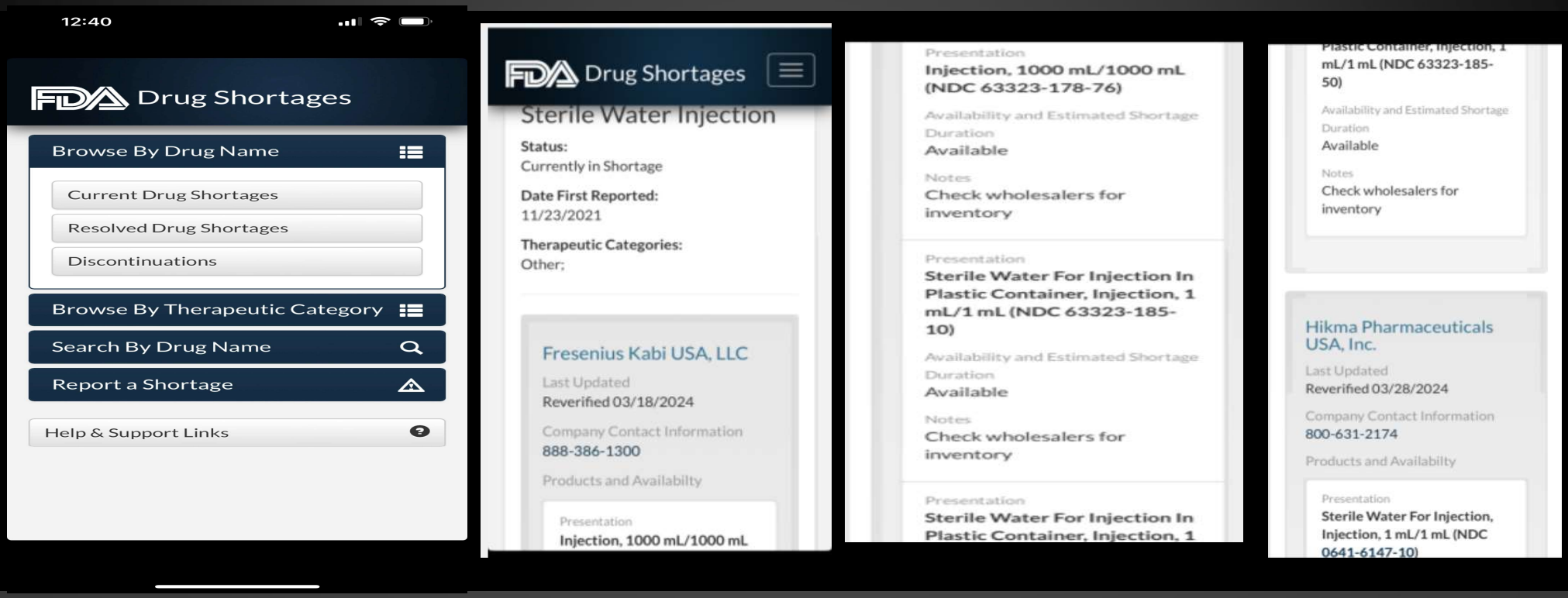
19. Vecuronium bromide injections have been in shortage since at least September 2015, and as of March 22, 2023, five products are unavailable because of increased demand.

20. Bupivacaine injections have been in a dearth since at least September 2015, and as of April 19, 2023, 32 solutions are in shortage and 15 are not.

ASHP drug supply database updated April 21, 2023

FDA DRUG SHORTAGES APP- IPHONE OR ANDROID

FDA SHORTAGES APP CONT'D



NEAR MISSES/ MEDICATION ERRORS

- Medication Shortages place an enormous burden on the healthcare facilities, clinicians, and ultimately, the patients
- If unavailable, the pharmacy department takes great care in working with the P & T committee to offer best alternative therapy
  - Updates CPOE Strings and CPOE order Sets
  - Sends out Fax Blasts
  - Updates Intranets
  - Places messaging on medications that are unavailable from the manufacturer(s)
- ISMP has reports that 6% of adverse outcomes with drug shortages were related to "an error when a pharmacy attempted to compound a product or drug strength no longer available."
- In Florida, reporting is not mandatory unless a sentinel event occurs and facility receives Medicare or Medicaid dollars.
- National Databank is FDA's Medwatch and reported information is deidentified data
- HCA facilities are encouraged to report in Vigilanz b/c protected by (Patient Safety Organization-PSO;) therefore not discoverable
- Follow your organization's reporting instructions especially as it relates to PSO's

DRUG SHORTAGE COMPOUNDING ERROR LEAD TO BACLOFEN TOXICITY IN AN INFANT

- Four-month old female with tracheostomy and G-tube-dependent due to Treacher Collins Syndrome admitted to PICU with respiratory compromise and acute mental status changes
- Described by parents as being in usual state of health when mother administered evening dose of omeprazole via G-tube.
- Over the next hour, the infant began intermittent bouts of intense crying over the next hour. Although consolable, parents became increasingly concerned as she developed symptoms including pallor, irregular breathing pattern with periods of gasping, and episodes of apnea. She experienced one episode in which her eyes rolled upward without irregular movements of the extremities.
- Parents ventilated the patient via the tracheostomy
- On evaluation, the neurologists noted the patient had abnormal movements described as upper limb posturing with one arm stiffened and extended and the other reflexed, lower limb movements and eye movements were rhythmic. The episode ended after two IV doses of lorazepam 0.1 mg/kg.
- LP not significant except for bloody tap (RBCs 520, WBC 2, protein 57, glucose 61, negative cultures, opening pressure 20 mmHg

J Pediatr Pharmacol Ther. 2016 Nov-Dec; 21(6): 527-529.

PATIENT CASE CONT'D

- EEG- suggestive of moderate to severe encephalopathy
- Neurology recommended toxicology studies for opiates, alcohol, THC, cocaine, amphetamines and BZDs
- All negative
- Patient discharged day two with the request to bring the omeprazole to the hospital
- Noted to have dark discolored precipitate and a metallic odor
- Hospital medical and pharmacy staff contacted the retail pharmacy who were first reported using a published recipe using omeprazole capsules and sodium bicarbonate, but upon further investigation, realized an error had been made.
- Due to the shortage of sodium bicarbonate injection, the pharmacy had to use sodium bicarbonate powder which is stored alphabetically with the other powders on the shelf.
- The pharmacist mistakenly mixed with baclofen powder
- The calculated dose received- 480 mg was approximated **160 times the dose recommended for spasticity in a 4-month old**

J Pediatr Pharmacol Ther. 2016 Nov-Dec; 21(6): 527-529.

ISMP SURVEY: SHORTAGES COMPROMISE CARE 2018

Table 1. Examples of medication errors associated with drug shortages reported by survey respondents

Pharmacy had to compound **EPINEPH**rine with lidocaine, resulting in the wrong concentration.
EPINEPHrine 1 mg per mL vial was used to prepare and administer an IV dose; drug was not diluted, and wrong dose was administered.
Dispensed e**PHED**rine instead of **EPINEPH**rine to the operating room, **EPINEPH**rine was unavailable in stock in its usual location.
Used a multiple-dose vial with a preservative to prepare an epidural infusion when preservative-free bupivacaine with **EPINEPH**rine was unavailable.
Anesthesia staff tried to make their own bupivacaine with **EPINEPH**rine 1:200,000 by adding **EPINEPH**rin to plain bupivacaine, resulting in variable concentrations.
DOPamine infusion unavailable and prepared at the wrong concentrations, resulting in both under-and overdoses.
DOPamine 800 mg per 250 mL selected in error and administered when 400 mg per 250 mL bags were unavailable.

ISMP SURVEY 2018 CONT'D

Potassium chloride small volume infusion was prepared at the wrong concentration and administered.
Wrong concentration of sodium acetate injection was added to an automated compounder, several patients received the wrong dose in their patenteral nutrition.
when sodium acetate was unavailable and there was a severe restriction on sodium bicarbonate, the pharmacy used potassium acetate in an IV solution; the final product contained 150 mEq of potassium per liter but was fortunately not administered to the patient.
1 mL **LOR**azepam vials (2 mg per mL) were not available; pharmacy received 10 mL vials (2 mg per mL), which entered into stocks as 10 x 1 mL vials.
1 mL vials of morphine 10 mg dispensed when 2 mg vials were unavailable; 10 mg IV administered in error.
HYDROmorphone 1 mg administered instead of 0.5 mg because the 0.5 mg syringes were unavailable.
Ordered **HYDRO**morphone prefilled syringes from a different manufacturer; nurse gave the medication orally because the syringe looked like an oral syringe, although it was clearly labeled for IV use.

Drug Shortages Continue to Compromise Patient Care | Institute For Safe Medication Practices (ismp.org)

ISMP SURVEY 2018 CONT'D

Selected an ampul of **SUF**entanil instead of fenta**NYL** and administered it during a fenta**NYL** shortage.
A patient received no treatment when a drug known to be unavailable was ordered verbally, and the nurse did not notify the pharmacy about the order or request an alternative.

Drug Shortages Continue to Compromise Patient Care | Institute For Safe Medication Practices (ismp.org)

QUALITATIVE PATIENT EXPERIENCE AND VIEW

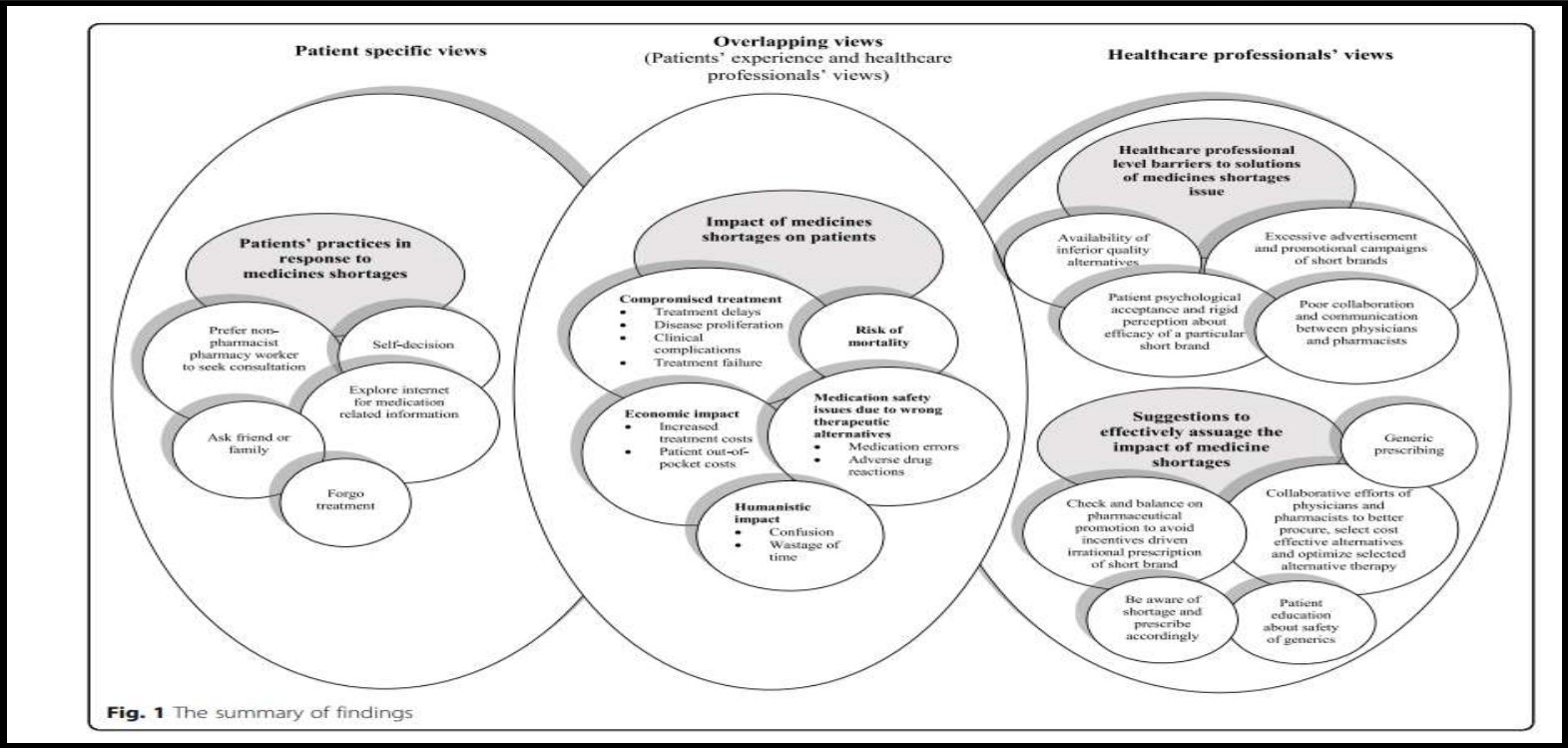


Fig. 1 The summary of findings

Medicine shortages impact. Atif et al. BMC Health Services Research; (2021) 21:827

ONCOLOGY DRUG SHORTAGES SURVEY 2020

- Surveyed Hematology/Oncology Pharmacists from Dec 19-July 20
- 68 US organizations participated
- 63 reported one or more shortages per month with 34% stating an increase from 2018 to 2019
- 75% reported treatment delays, reduced doses and/or alternative regimens necessary
- Most difficult agents to obtain: vincristine, vinblastine, IVIG, leucovorin, and bacillus calmette-Guerin
- **Near-miss med errors were reported in 4%** (3) survey participants
  - Dose-conversion errors between IV and oral etoposide
  - Incorrect EMR builds leading to confusing preparation and administrations
- **Six percent reported a medication error** due to shortages
- Clinical Trail impact on 13%- n=6 could not enroll; additional documentation and communication with IRB (n=5); delayed approval/activation (n=2).

MOST DIFFICULT TO OBTAIN CHEMOTHERAPY AGENTS

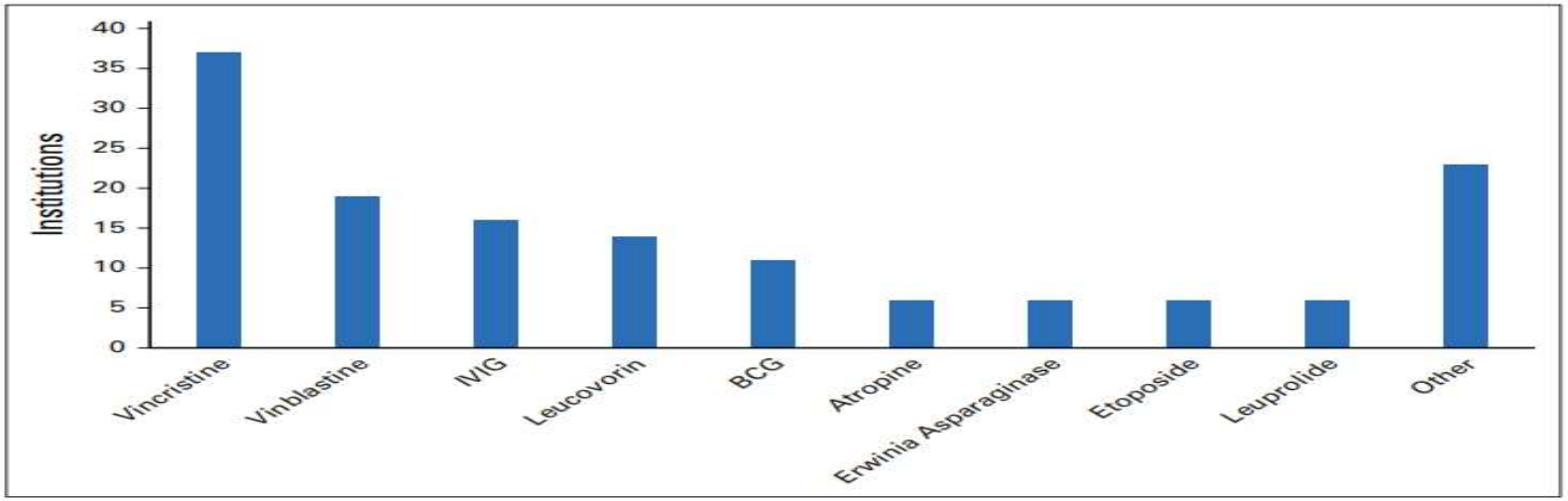


FIG 1. Most difficult to obtain: chemotherapy and supportive care agents (n = 53). Institution participants were asked to identify three most difficult drugs to obtain. Other medications include bleomycin (n = 2), famotidine (n = 2), fluoruracil (n = 2), sodium bicarbonate (n = 2), tacrolimus (n = 2), aprepitant (n = 1), carboplatin (n = 1), doxorubicin (n = 1), gemcitabine (n = 1), fludarabine (n = 1), granisetron (n = 1), ibrutinib (n = 1), intravenous temozolomide (n = 1), nelarabine (n = 1), paclitaxel (n = 1), thiotepa (n = 1), vinorelbine (n = 1), and ranitidine (n = 1). BCG, Bacillus Calmette-Guerin; IVIG, intravenous immune globulin.

FREQUENCY OF REPORTED ONCOLOGY DRUG SHORTAGE

TABLE 2. Frequently Reported Oncology Drug Shortages (n = 52)

Drug	Experienced Shortage (%)	Minimal Delay (< 7 days in procuring agent; %)	Major Delay (> 7 days in procuring agent; %)
Epirubicin	90	5	0
Flutamide	90	10	0
Decitabine (IV)	82	9	5
Mechlorethamine	82	5	0
Melphalan (IV)	81	13	5
Dactinomycin	79	12	4
Pentostatin	76	5	9
Fludarabine	74	9	13
Degarelix	72	5	9
Carmustine	71	5	10
Paclitaxel	68	25	4
Dacarbazine	67	21	8

Abbreviation: IV, intravenous.

SHORTAGE OF ONCOLOGY SUPPORTIVE THERAPY

TABLE 3. Frequently Reported Supportive Care Agents in Oncology Practice Drug Shortages (n = 47)

Drug	Experienced Shortage (%)	Minimal Delay (< 7 days in procuring agent; %)	Major Delay (> 7 days in procuring agent; %)
Hydrocortisone	83	6	6
Promethazine	79	6	11
Mycophenolate sodium	76	12	12
Metronidazole (IV)	74	0	11
Metoclopramide	72	6	11
Ganciclovir	70	15	5
Fluconazole	70	20	5
Mycophenolate mofetil	67	17	11
Ondansetron (IV)	62	14	5
Dexamethasone (IV)	62	27	8
Tacrolimus (PO)	60	0	20
Prochlorperazine	52	14	10
Acyclovir (IV)	50	25	8

Abbreviations: IV, intravenous; PO, orally.

DRUG SHORTAGES WORSENING, PHARMACISTS SAY

- The American Society of Health-System Pharmacists (ASHP) drug shortage list for March 2022 logged the following additions alone:
  - Sodium chloride solution, sodium bicarbonate injection, dextrose injection, bacteriostatic water, Ringer's solution, potassium chloride, acetate and phosphate injection products
- Supply issues such as IV tubing, Epidural Tubing, needles have extended shortage problems and added dimensions to delivery problems
- In some areas, South Florida being one of those areas, pharmacy departments are also negatively impacted by technician shortages who are critical to keeping the ADC's filled, IV rooms running smoothly and drug delivery within the pharmacy departments workflow, optimal
- Pharmacy departments are spending a minimum of five to 10 hours a week managing drug shortages

AJHP Vol 79, (10) 15 May 2022; 713-714

SUMMARY OF THE NEUROMUSCULAR BLOCKER ERROR EVENT

- In 2017 patient was admitted to the neurology intensive care unit with a headache and vision field loss in the left eye
- MRI confirmed an intraparenchymal hematoma of the brain, possibly related to a suspected mass behind it
- Two days later, provider entered order to transfer patient to step-down unit
- Patient was transported to radiology for PET scan
- While radiology tech was explaining the PET scan to the patient, the patient requested medication to help ease anxiety due to claustrophobia
- Provider was contacted and he entered two electronic orders.
- VERSED (midazolam) 2 mg intravenously (IV), with instructions "for PET scan, if first mg insufficient, can give 1-2 mg additional if needed." **note: Versed is no longer available as a brand of midazolam**
- The physician then clarified the order by prescribing a one-time dose of Versed 1 mg IV prior to the PET scan. A pharmacist verified the orders within a few minutes.

NMB EVENT PER ISMP CONT'D

- According to the CMS report, a radiology technician called the patient's primary nurse to ask if she could send a nurse to administer the IV Versed. The primary nurse asked if a radiology nurse could administer the IV Versed, but the technician said that the nurse was uncomfortable administering this drug and that the patient would need to be monitored. Primary nurse agreed to send a nurse and rad tech injected the radioactive tracer to the PET scan could be completed an hour later
- Primary nurse was covering another nurse's patients, so she asked the help-all (resource/floater) registered nurse, who was orienting a new nurse, to go to radiology to administer the IV Versed. The help-all nurse had been on her way to the ED to conduct a swallowing study, but agreed to first administer the IV Versed to the patient in radiology.
- The help-all nurse used the neuro-ICU automated dispensing cabinet; entered "VE" under the patient's profile search and no medications came up; the ADC defaults to generic- she did NOT change to BRAND
- When the help-all nurse could not find Versed, she switched to override **and typed "VE" and selected the first medication that populated,** which was the NMB, Vecuronium, not Versed.
- She encountered a Red Box warning noting that the order should be associated with a STAT provider order

NMB EVENT PER ISMP CONT'D

- The cabinet opened, nurse removed a vial of vecuronium lyophilized powder 10 mg (1 mg/mL when reconstituted with 10 mL), believing it was Versed. **Although NMBs were on the facility High Alert medication list, there were no specific precautions in place prior to removal via override**.
- While removing the vial, she noticed it was a powder and turned the vial over to read the reconstitution directions on the back of the label, never actually reading the drug name on the front of the vial. She also did NOT recognize that Versed is only available as a liquid formulation.
- CMS report notes that the nurse put the vecuronium vial along with two saline 10 ml flushes, alcohol pads, and a blunt tip needle, labeled with bag with the patient sticker and a handwritten not that said "PET scan Versed 1-2 mg."
- Patient was in a holding room awaiting the tracer perfusion. The help-all nurse found the patient, verified identity and told her the medication would help her relax. She reconstituted the medication and withdrew the contents; During reconstitution she did not see or misunderstood the warning on the red vecuronium vial that said "**WARNING: PARALYZING AGENT,**" which has been previously overlooked or misunderstood with other neuromuscular blocker errors.

NMB EVENT PER ISMP CONT'D

- The help-all nurse administered an unknown quantity of IV vecuronium to the patient believing it was Versed and used the second flush to flush the patient IV line
- The nurse thought she administered 1 mg (1 mL); however the empty vecuronium vial and two flush syringes were later brought to the Neuro ICU for wasting of what was thought to be Versed; One syringe had 8 mL in it and the other had 1.5 mL remaining- no way to tell which was which
- The help-all nurse went to the ED to conduct the swallowing study; she did NOT monitor the patient in radiology; no reaction to the medication she administered, vital signs, observe for respiratory sufficiency or determine if the patient if the patient needed an additional dose of what was thought to be Versed.
- Facility had conscious and moderate sedation policies in place, however, the drug administration policy did not specify manner or frequency of patient assessments
- Rad tech periodically observed patient in holding room via camera; thought the patient's eyes were closed because the patient was relaxing or bothered by the lights in the room
- The camera was NOT sharp enough to visualize that the patient's chest was NOT rising and falling

NMB EVENT PER ISMP CONT'D

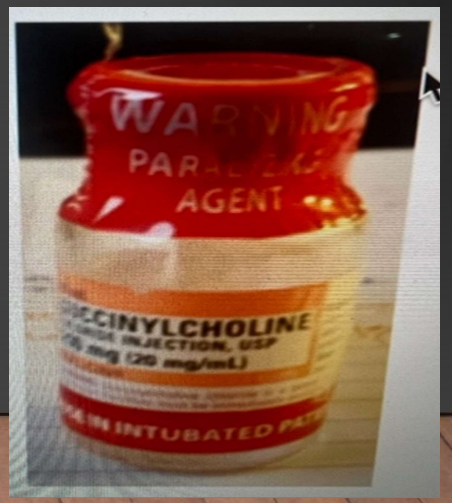
- About 25-30 minutes AFTER the vecuronium was administered a transporter noticed the patient was unresponsive
- Patient found pulseless and breathless- rapid response team/code blue was called
- Patient intubated and eventually regained spontaneous circulation
- Help-all nurse responded to the code and transferred the patient back to Neuro ICU and told the physician that she had administered IV Versed about 30 minutes before the code; she handed the bag containing the empty vial and syringes to the patient's primary nurse to document the waste, who noticed the error, reported to the physician and disclosed to the family
- A few hours in the ICU, patient began displaying myoclonic jerks and posturing consistent with anoxic brain injury
- CT showed increased swelling in the area, but the bleed had not worsened. It was suspected that the medication error, not worsening hemorrhage, was responsible for the patient's arrest and subsequent anoxic brain injury
- By the next day, patient's neurological sequelae worsened; the patient died after life support withdrawn

SAFE PRACTICE RECOMMENDATIONS- ADCS

- Optimized Profiled Automated Dispensing Cabinets (ADC)s - inpatient and outpatients settings
- Manage override lists (limit)
- Block Staff from loading inappropriate medications (device specific)
- Utilize warnings during removal
- Witness override medication removal
- Allow simultaneous searching (brand and generic)
- Support distraction-free ADC medication removal
- Neuromuscular Blocker Safety features
  - Limit-perioperative, L & D, critical care and ED
  - Store in Sealed Box, Locked Lidded pocket or RSI kit
  - Place auxiliary Label on ADC pocket/drawer/lid/kit "**warning: causes respiratory arrest- patient must be ventilated**"
  - Warning visible when open
- Five letter search requirement*

HEALTHCARE PROVIDER RECOMMENDATIONS

- Plan for sedation
  - Sedation for procedures (oral/enteral when possible)
  - Patient monitoring during and after drug administration
- Include IV moderate sedation on high-alert lists
  - Include commonly used medications used for moderation sedation on high-alert list and implement risk reduction strategies to prevent errors and harm
  - Address monitoring requirements
- Store NMBs safely
- Affix warnings (auxiliary labels)
- Build interactive warnings (must be intubated)



RADONDA VAUGHT, RN CONVICTED CRIMINAL NEGLIGENT HOMICIDE AND GROSS NEGLECT OF AN IMPAIRED ADULT

- Former registered nurse fired from Vanderbilt University Medical Center after making fatal medication error
- Stripped of professional nursing license by the Tennessee Board of Nursing
- Three-day trial and faced a charge of reckless homicide, but the 12-member jury found her guilty of the lesser-charge, negligent homicide
- Inadequate handling of the trial
  - Lack of evidence regarding system failures
    - Prosecution chose to ignore the fact that the error was a culmination of multiple system failures
    - Defense failed to educate the jury about these system failures
      - Access on override to NMB after entering two letters of the name, inability to simultaneously search brand and generic drug names, unsafe storage of NMBs outside a sealed box or RSI kit, allowing medications to be ordered via Brand Name, lack of bar code technology in radiology,

CRIMINALIZATION OF HUMAN MEDICATION ERROR CONT'D

- Truthful reporting and harsh self-blame used to incriminate RaDonda
  - She made immediate disclosures, further contributing her knowledge to her employer, investigators and TN Board of Nursing
  - It wasn't until criminal charges were filed that she realized she needed to protect herself
  - RaDonda is often quoted as saying "I know the patient is no longer here because of me"
- RaDonda's defense included testimony from only one witness
  - Prosecution called 16 witnesses while the defense called 1
  - RaDonda did not take the stand as she did NOT want to be berated by prosecution any longer
  - Who knows if a med safety officer could have been helpful in her defense
- Prosecution misled the jury regarding recklessness
  - Correctly defined in opening and closing statements however during trial claimed RaDonda

CRIMINALIZATION OF HUMAN MEDICATION ERROR CONT'D

- acted "recklessly" when she consciously disregarded certain policies, procedures, the usual standard of practice or a safety protocol but did NOT establish that she consciously disregarded a substantial and unjustifiable RISK associated with her choices

- The event could have been prevented
  - In 2016, ISMP published a feature article about errors with Neuromuscular Blocking Agents- encouraging all healthcare organizations to reassess the safety

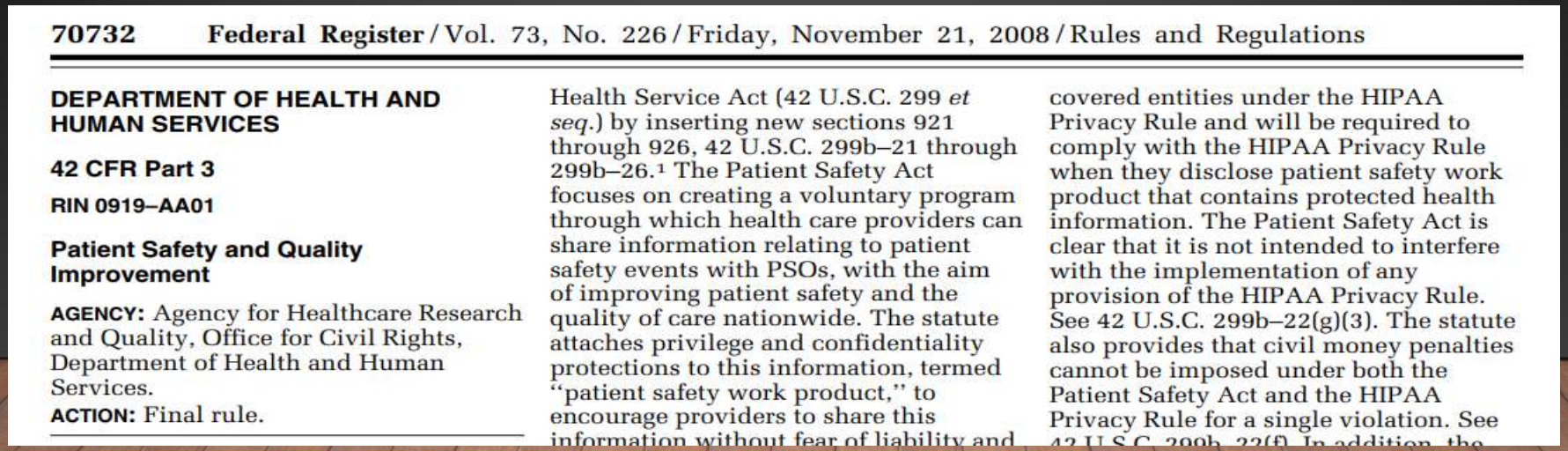
- Unfairness of the Trial and Guilty Verdict
  - Offensive attribution of RaDonda's behavior as "driving drunk" and "driving with her eyes closed"
    - Prosecution used an expert witness, legal nursing consultant with 47 years of experience, to testify that RaDonda had several chances to recognize the error, but did not
    - This expert had never heard the term Just Culture, knew little about system-based causes of errors and was unaware of the Investigative report from CMS (*a report that was triggered anonymously because Vanderbilt never reported the sentinel event*)

GUILTY VERDICT'S IMPACT ON HEALTHCARE

- The guilty verdict will likely inhibit error reporting, undermine the creation of a culture of safety, accelerate the exodus of practitioners from clinical practice, exacerbate the shortage of healthcare providers. Perpetuate the myth that perfect performance is achievable and impede system improvements
- RaDonda Vaught was sentenced to three years supervised probation

PATIENT SAFETY ORGANIZATION- PSO

- Patient Safety and Quality Improvement: Final Rule (medcity.net)
  - Federally recognized with the aim of improving patient safety and quality of care in the US
  - Attaches privilege and confidentiality protections to this information
  - "patient safety work product"
  - To encourage providers to share information without fear of liability and allows for analysis of patient safety events



70732 **Federal Register** / Vol. 73, No. 226 / Friday, November 21, 2008 / Rules and Regulations

DEPARTMENT OF HEALTH AND HUMAN SERVICES

42 CFR Part 3

RIN 0919–AA01

Patient Safety and Quality Improvement

AGENCY: Agency for Healthcare Research and Quality, Office for Civil Rights, Department of Health and Human Services.

ACTION: Final rule.

Health Service Act (42 U.S.C. 299 *et seq.*) by inserting new sections 921 through 926, 42 U.S.C. 299b–21 through 299b–26.[1] The Patient Safety Act focuses on creating a voluntary program through which health care providers can share information relating to patient safety events with PSOs, with the aim of improving patient safety and the quality of care nationwide. The statute attaches privilege and confidentiality protections to this information, termed "patient safety work product," to encourage providers to share this information without fear of liability and

covered entities under the HIPAA Privacy Rule and will be required to comply with the HIPAA Privacy Rule when they disclose patient safety work product that contains protected health information. The Patient Safety Act is clear that it is not intended to interfere with the implementation of any provision of the HIPAA Privacy Rule. See 42 U.S.C. 299b–22(g)(3). The statute also provides that civil money penalties cannot be imposed under both the Patient Safety Act and the HIPAA Privacy Rule for a single violation. See 42 U.S.C. 299b–22(f). In addition, the

ISMP TARGETED MEDICATION SAFETY BEST PRACTICES

- Preventing wrong patient errors when filling prescriptions, responding to questions, and administering vaccines
- Expanding and maximizing the use of barcode scanning during medication and vaccine dispensing and administration
- Avoiding errors involving inadvertent daily dosing of methotrexate for non-cancer indications
- Standardizing the use of metric (milliliter--mL) units of measure when prescribing, dispensing, and measuring oral liquid medications
- Using information about medication safety risks and errors that have occurred in other organizations to take preventative action

Institute for Safe Medication Practices (ISMP). *ISMP Targeted Medication Safety Best Practices for Community Pharmacy*. ISMP; 2023: https://www.ismp.org/guidelines/best-practices-community-pharmacy

HHS RELEASES WHITE PAPER ON DRUG SHORTAGES

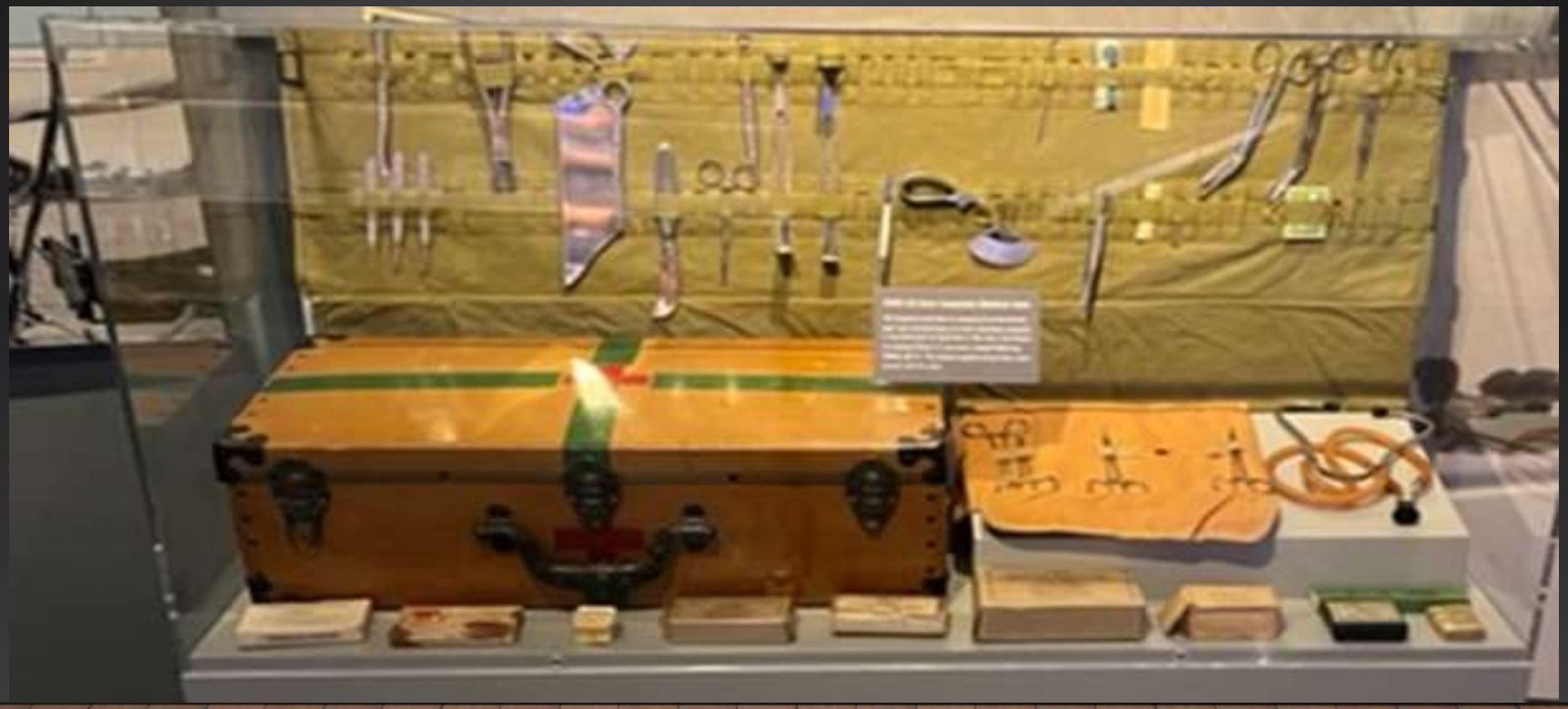
FOR IMMEDIATE RELEASE
April 2, 2024

Contact: HHS Press Office
202-690-6343
media@hhs.gov

HHS Releases White Paper Focused on Preventing Drug Shortages

- Describes policy concepts for consideration including collaboration with the private sector to develop a manufacturer resiliency assessment program and a hospital resilient supply program
- Incentivize for domestic manufacturing
- Focus on generic sterile injectables

QUESTIONS



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