Do Not Pass Go: Creating Safety with IV Workflow Management Systems

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Disclosure

We have NO financial disclosures or conflicts of interest with the materials in this presentation.

Learning Objectives for Pharmacists

- Discuss the substitution myth associated with the use of technology
- Illustrate how to address safety risk throughout a technology build and implementation process
- Describe how to use a pharmacy IV workflow management system dashboard to monitor sterile compounding practices

Learning Objectives for Technicians

- Discuss the substitution myth associated with the use of technology
- Illustrate how to address safety risk throughout a technology build and implementation process
- Describe how to use a pharmacy IV workflow management system dashboard to monitor sterile compounding practices

UChicago Medicine

- 811-bed academic medication center
- Level 1 adult and pediatric trauma facility
- International health system
- Integrated Delivery Network
  - Center for Care and Discovery
  - Comer Children's Hospital
  - Mitchell Hospital
  - Duchossois Center for Advanced Medicine (DCAM)
  - Ingalls Memorial

Creating Safety

Charlene A. Hope, PharmD, MS, BCPS, CPPS

Chief Pharmacy and Medication Safety Officer

Do you currently work at a hospital that has implemented IV Workflow Software?

A. Yes
B. No

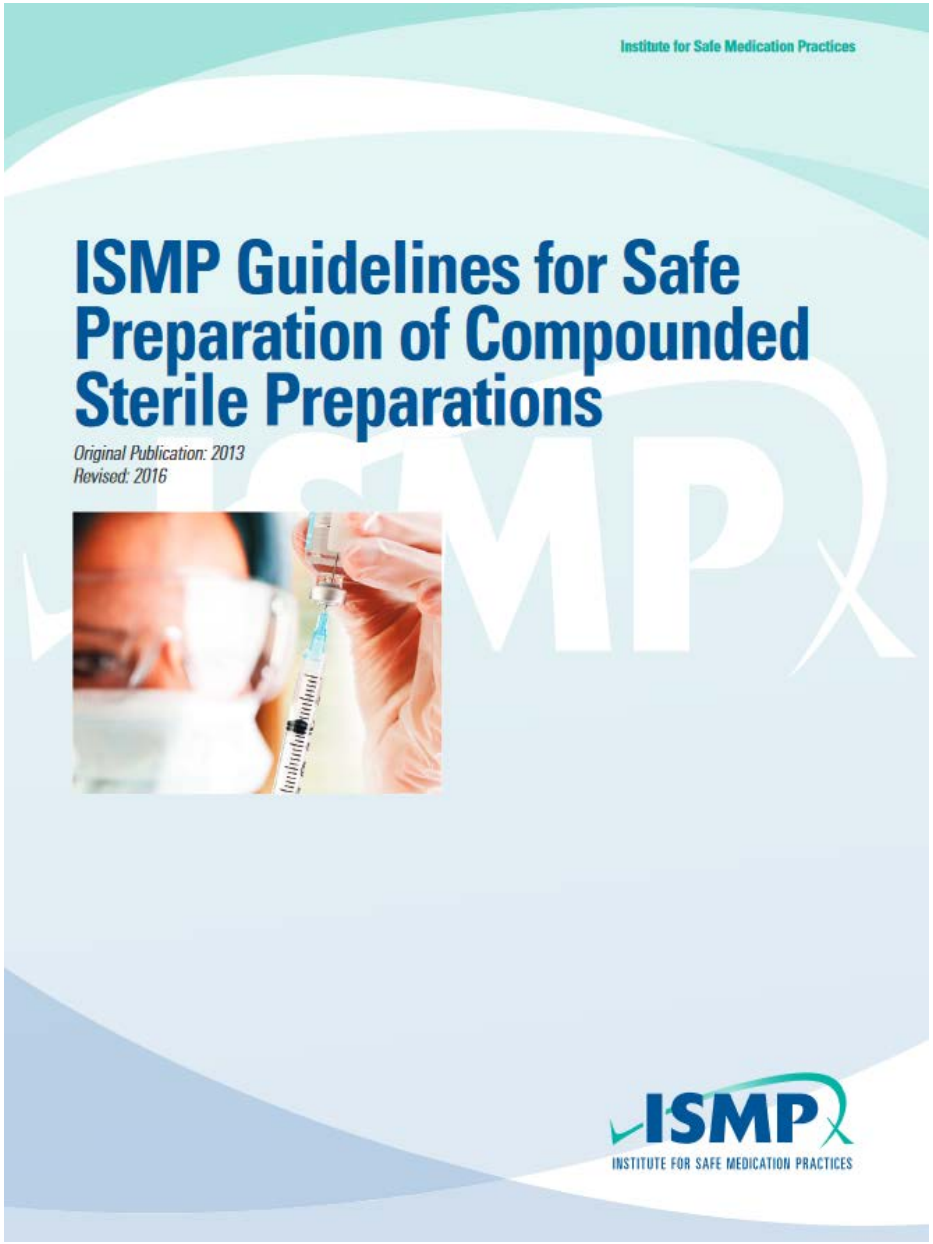
Between the years 2004 and 2011, how many serious compounding errors, did ISMP report died, mostly due to wrong concentration/strength, or wrong product or diluent errors?

A. 6
B. 9
C. 16
D. 19

SYRINGE PULL-BACK METHOD

BEST PRACTICE 11: When compounding sterile preparations, perform an independent verification to ensure that the proper ingredients (medications and diluents) are added, including confirmation of the proper amount (volume) of each ingredient **PRIOR** to its addition to the final container.

Institute for Safe Medication Practices (ISMP). *ISMP Targeted Medication Safety Best Practices for Hospitals*; 2017. https://www.ismp.org/guidelines/best-practices-hospitals.



CORE PROCESSES

- Policies and Procedures for Compounding Sterile Preparations
- Order Entry and Verification
- Drug Inventory Storage
- Assembling Products and Supplies for Preparation
- Compounding
- Drug Conservation
- Compounding Performed Outside the Pharmacy IV Admixture Service
- Preparation of Source/Bulk Containers
- Technology/Automation Used for Compounding CSPs, including barcode scanning and gravimetrics
- Automated Compounding (Pumping) Systems
- Quality Control/Final Verification
- Product Labeling
- Staff Management

Institute for Safe Medication Practices (ISMP). *ISMP Guidelines for Safe Preparation of Compounded Sterile Preparations*; 2016. https://www.ismp.org/guidelines/sterile-compounding

QUALITY CONTROL/FINAL VERIFICATION

- All personnel have the authority to “stop the line” (i.e., call a halt to compounding activities) and question any concerns about any order or any sterile preparation to be compounded.
- For batched CSPs, a quality assurance plan shall include written standards for qualitative and quantitative integrity, potency, and labeled strength.
- Proxy methods of verification of ingredients, such as the SYRINGE PULL-BACK METHOD of verification are never used.
- Errors and near misses that occur during the compounding of CSPs and are identified by either the pharmacist or technician prior to dispensing are documented and reported through the organization’s reporting system for analysis.
- Serious incidents are reported to the ISMP MERP (ISMP forwards reports to FDA MedWatch) for learning purposes and dissemination of prevention measures.
- Proactive risk assessments, such as failure mode and effects analysis (FMEA) are used prior to the implementation of process changes.
- Internal as well as external information about medication errors, from sources such as ISMP, are reviewed and used to modify practices and procedures as needed.

Institute for Safe Medication Practices (ISMP). *ISMP Guidelines for Safe Preparation of Compounded Sterile Preparations*; 2016. https://www.ismp.org/guidelines/sterile-compounding

Human Factors

Ergonomics (or human factors) is the scientific discipline concerned with the understanding of interactions among humans and other elements of a system, and the profession that applies theory, principles, data, and other methods to design in order to optimize human well-being and overall system performance.

International Ergonomics Association accessed - https://www.iea.cc/whats/index.html

TRUE OR FALSE

Implementation of new technology removes potential for human error.

Technology and Human Error Discussion

Substitution Myth

- Technology substitutes for human work
- The introduction creates ***NEW*** human work
- Creates new opportunities for error and pathways to failure.
- Changes the kinds of errors that people can make and the kinds of expected or required interactions with other professionals or department.

Human Factors and New Technology

DATA OVERLOAD

- Too much data on a screen
- Workload bottlenecks
- Difficulty finding the significance, or meaning of data at the time it is needed

AUTOMATION SURPRISES

- Redistributes rather reduces of workload
- New attentional demands
- Creates new demands on human expertise
- Operators figure out how to work the system but have not idea how the system works (Sarter).

Maximize Benefits of IV Workflow Management Systems by Addressing Workarounds and Errors

Potential Workarounds

Barcode Management

- Inability to scan barcodes
- Reluctance to scan barcodes
- Scanning one vial

ISMP Medication Safety Alert! Acute Care Edition. September 7, 2017;22:1-4.

Maximize Benefits of IV Workflow Management Systems by Addressing Workarounds and Errors

Images

- Using a decoy or scanning or image capture
- Blurry or missing digital images.

Images courtesy of ISMP

ISMP Medication Safety Alert! Acute Care Edition. September 7, 2017;22:1-4.

Maximize Benefits of IV Workflow Management Systems by Addressing Workarounds and Errors

User Technique

- Using the syringe pull back method
- Lapses in technique

ISMP Medication Safety Alert! Acute Care Edition. September 7, 2017;22:1-4.

Maximize Benefits of IV Workflow Management Systems by Addressing Workarounds and Errors

Other human errors

- System entry errors
- Labeling errors
- Visual verification systems

ISMP Medication Safety Alert! Acute Care Edition. September 7, 2017;22:1-4.

Risk factors for i.v. compounding errors when using an automated workflow management system

Purpose

- To determine the frequency of and risk factors for errors in automated compounding of i.v. medication doses at a pediatric hospital.

Methods

- The hospital's automated i.v. compounding workflow management system over a 12-month period were complied and analyzed.

Risk factors for i.v. compounding errors when using an automated workflow management system, *American Journal of Health-System Pharmacy*, Volume 73, Issue 12, 15 June 2016, Pages 887–893, https://doi.org/10.2146/ajhp150278

Risk factors for i.v. compounding errors when using an automated workflow management system

Results

- Of 421,730 i.v. doses evaluated, there were 3,101 documented errors (an overall error rate of 0.74%).
  - 72.27% of the errors intercepted
  - 27.73% of errors identified upon final inspection by pharmacist
    - Dose preparation in the wrong volume (21.51%)
    - Damage to the final product (0.93%)

Four factors were associated with an increased risk of compounding errors:

- Dose preparation
  - during the morning shift
  - on a Sunday
- Preparation of doses for use in critical care units
- Technician versus pharmacist compounding

Risk factors for i.v. compounding errors when using an automated workflow management system, *American Journal of Health-System Pharmacy*, Volume 73, Issue 12, 15 June 2016, Pages 887–893, https://doi.org/10.2146/ajhp150278

Build and Implementation

Maggie Wong, PharmD, BCPS

Informatics Pharmacist Specialist

Planning

- Walk-through with IV room staff
  - Understand workflows
  - Physical space evaluation
- Build considerations
  - Scope of implementation
  - Feeding of information

Putting the Pieces Together

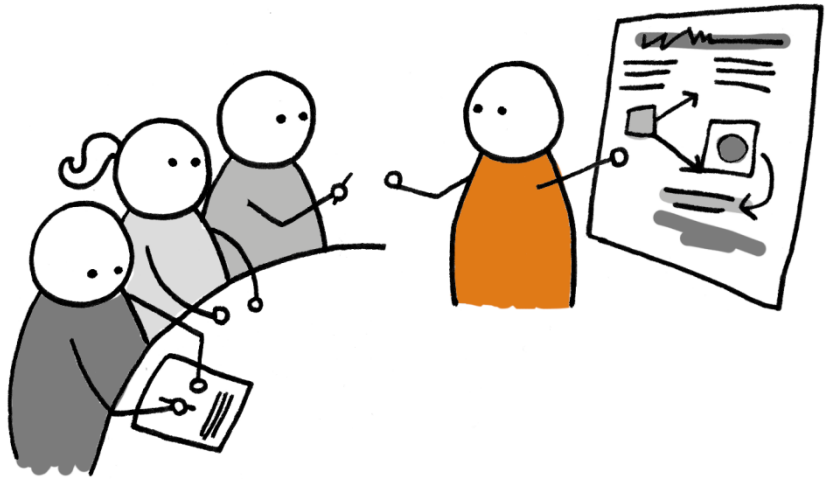
- Matching systems to work together
  - Mapping data from electronic health record to IV workflow management system
    - Drugs, routes, diluents, etc.

Testing and Validating

- Multiple test scenarios at multiple sites of implementation
  - Uncovers differences and inconsistencies in practices and workflows across different sites
- Standardization of workflows across sites sharing the same IV workflow management system build

Training

- Vendor conducted initial on-site training for all end-user staff
- Super-users identified and received additional training
  - Continue to train new staff



Go-Live

- Phased go-lives over multiple IV prep sites
  - Off-site chemo clinics (July 2018)
  - On-site chemo clinic and inpatient chemo services (August 2018)
  - Main hospital IV room (August 2018, October 2018, and February 2019)

What is an important consideration when implementing a new technology that is shared across multiple sites?

A. Making everyone happy
B. Standardization of workflows
C. Having multiple project managers – one for each site
D. Allowing each site to have their own build instance

What are some safety considerations you would consider during your build and implementation?

Safety Considerations at UChicago Medicine

- Standardization of workflows
- Additional banners for chemotherapy agents, hazardous drugs, etc.
- Limiting routes and diluents for drugs
- User role access in IV workflow management system

Lessons Learned

Kathleen Kane, PharmD

Pharmacy Manager, Sterile Products

Workflow Changes post Go-Live

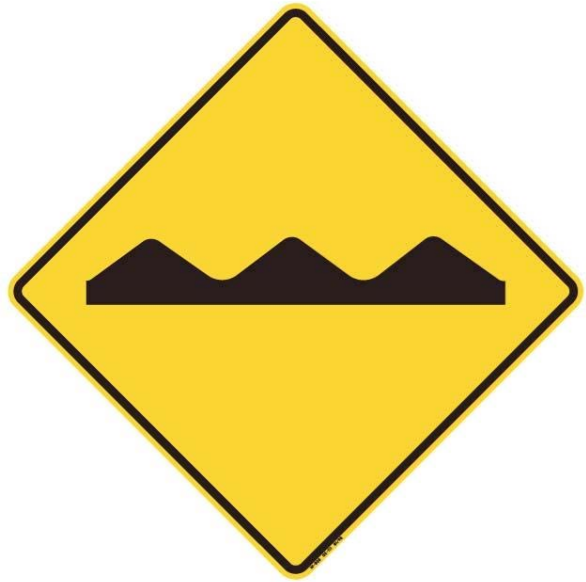
- Turn Around Time
- Timing of batch preparations
- Timing to prepare doses
- Storage of materials
- Staffing
- Super-users

Managing Ongoing Issues Post Go-Live

- Monthly
  - Productivity Reports
  - Error Prevention Reports
- Weekly
  - Sessions with informatics team
  - Productivity report out to staff
    - Highs and lows
- Daily follow-up with staff at shift change
  - Collection of Bypass labels
  - Triage any questions or issues

Continued Challenges Post Go-Live

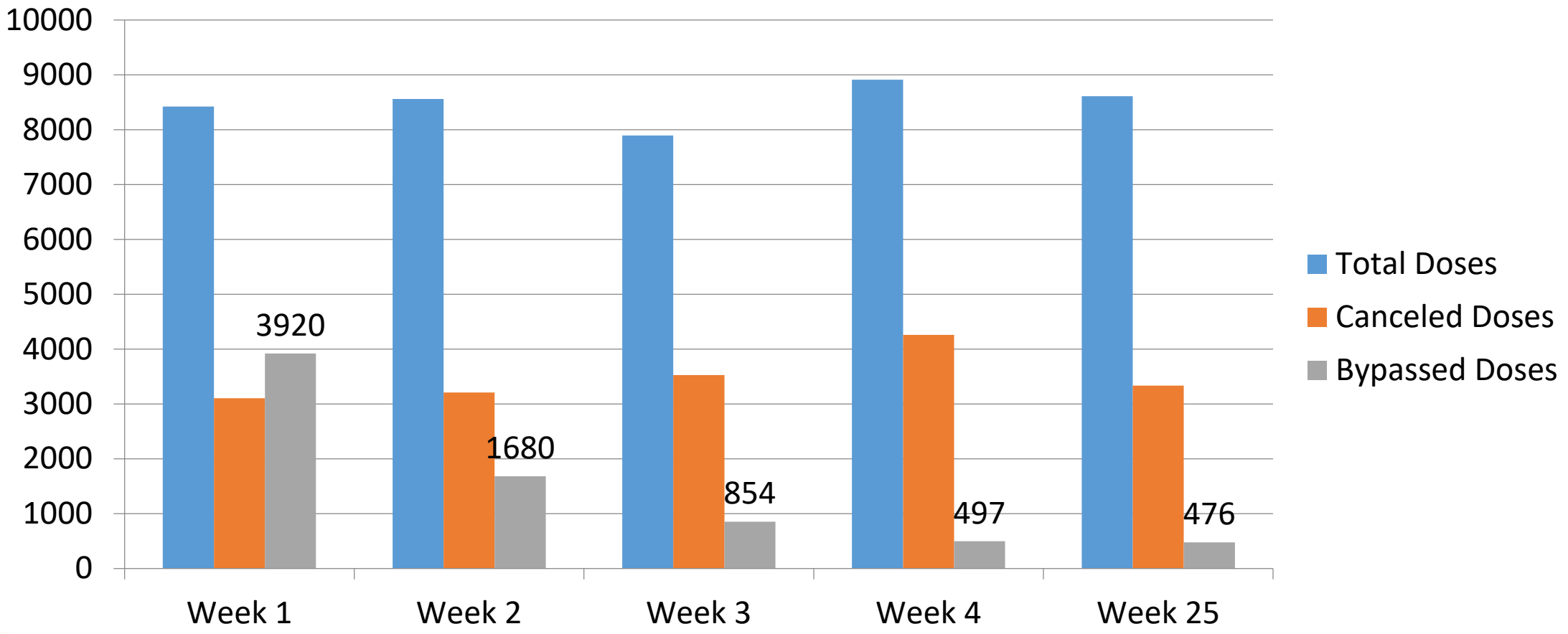
- Bypass
  - Working in the wrong mode
  - Products are not in the system
  - Items do not have barcodes
- Turn Around Time
  - Delay to therapy
  - Redispensing
- STAT doses
  - No true designation
  - Doses change based on due time
- Drug shortages
  - Products not previously entered into Workflow Management System (WFMS)
  - Compounding large batches



Lessons Learned Post Go-Live

- Staffing
  - Increased hours for production
- Order Entry
  - Dispense to locations matter
  - Build in WFMS matters
- New Products
  - Each new manufacturer or packaging of a product must be added
- Surprises not planned for

Success Story: Bypass Rates



If you had to create a report for productivity of an IV Workflow Management System which of the following would you look for?

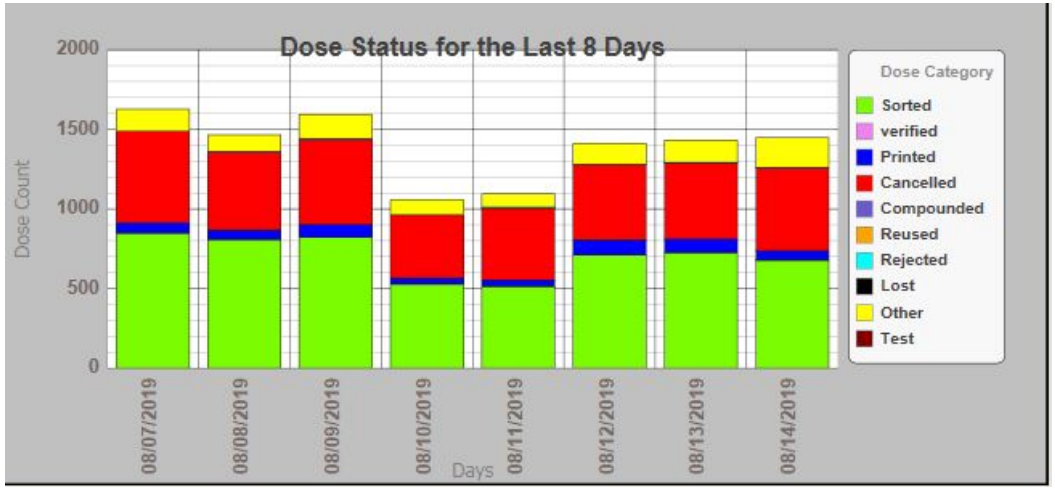
A. Prevented Errors

B. Bypass print count

C. Product Usage

D. Dose order prep statistics by user

Example Report



0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	TOTAL	Hourly AVG
0	0	0	0	0	0	0	53	105	84	115	54	27	53	52	1	0	0	0	0	0	0	0	0	544	22.67
0	0	0	0	0	0	0	0	4	10	20	25	21	4	11	10	1	0	0	0	0	0	0	0	106	4.42
0	0	0	0	0	0	0	0	9	9	11	19	10	4	9	14	3	0	0	0	0	0	0	0	88	3.67
0	0	0	0	0	0	0	0	6	10	0	0	0	1	1	0	0	0	0	0	0	0	0	0	18	.75
0	0	0	0	0	0	4	85	185	159	139	39	60	104	73	33	34	34	7	11	5	7	1	0	980	40.83
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	39	68	78	35	45	13	46	12	0	338	14.08
0	0	0	0	0	0	0	0	31	55	47	51	30	45	34	27	12	3	0	0	0	0	0	0	335	13.96
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	18	31	28	0	16	15	19	1	0	136	5.67
0	0	0	0	0	0	0	0	0	14	10	5	0	8	12	3	0	0	10	13	0	0	0	0	75	3.13
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	4	0	3	5	0	16	.67
0	0	0	0	0	0	26	0	5	2	1	0	0	0	6	0	0	0	0	0	0	0	0	0	40	1.67
0	0	0	0	0	0	0	0	1	3	5	8	0	0	0	2	1	0	0	0	0	0	0	0	20	.83
0	0	0	0	0	0	0	0	0	0	0	16	4	0	4	0	0	9	6	14	0	0	0	0	53	2.21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	16	24	1
0	0	0	0	0	0	0	2	11	14	12	12	12	9	12	8	14	20	0	0	0	0	0	0	126	5.25
0	0	0	0	0	0	3	37	30	10	1	2	0	3	2	0	0	0	0	0	0	0	0	0	88	3.67
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	.04
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	.04
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	7	4	1	0	1	8	0	0	0	23	.96
0	0	0	0	0	0	0	0	0	0	0	0	60	11	0	0	0	0	19	9	0	0	0	0	99	4.13
0	0	0	0	0	0	0	0	0	0	0	12	24	0	27	293	238	161	59	58	97	70	25	0	1064	44.33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	4	.17
0	0	0	0	0	0	0	0	0	0	0	19	8	0	0	0	0	0	14	4	0	0	0	0	45	1.88
0	0	0	0	0	0	0	33	28	38	28	23	0	5	3	1	0	0	0	0	0	0	0	0	159	6.63
0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	5	.21
136	121	122	76	80	52	72	6	0	0	0	0	0	0	0	0	0	0	0	0	0	1	46	95	807	33.63
0	0	0	0	0	0	0	0	0	0	0	32	18	0	0	0	3	0	21	7	0	0	0	0	81	3.38
0	0	0	0	0	0	0	0	0	0	0	23	9	0	0	0	0	0	0	0	0	0	0	0	32	1.33
0	0	0	0	0	0	0	15	68	49	55	50	38	24	20	15	6	0	0	0	0	0	0	0	340	14.17
0	0	0	0	0	0	0	0	25	32	21	17	7	13	24	15	1	0	0	0	0	0	0	0	155	6.46
0	0	0	0	0	0	0	16	1	0	7	5	9	4	8	3	0	0	0	0	0	0	0	0	53	2.21

TOTAL	Hourly AVG
544	22.67
106	4.42
88	3.67
18	.75
980	40.83
338	14.08
335	13.96
136	5.67
75	3.13
16	.67
40	1.67
20	.83
53	2.21
24	1
126	5.25
88	3.67
1	.04
1	.04
23	.96
99	4.13
1064	44.33
4	.17
45	1.88
159	6.63
5	.21
807	33.63
81	3.38
32	1.33
340	14.17
155	6.46
53	2.21

Which of the following is a true statement based on the example reports from the previous page?

A. Full time staff average verification of about 30 to 40 doses per hour

B. On average >1000 doses come into the IV Rooms each week day.

C. On average >500 doses that are not needed are not prepared in the IV Room leading to less waste

D. All of the Above

E. None of the Above

What do you think some of the biggest challenges would be with implementing an IV Workflow system into your setting and why?

Questions?

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