Intravenous Medication Administration: Smart Pumps and Other Approaches to Reduce the Potential for Harm

Tim Vanderveen, PharmD, MS

Consultant

ICU Medical

twv13571@icloud.com

Disclosure

- VP Center for Safety and Clinical Excellence – BD (Retired)

- Consultant to Medical Affairs – ICU Medical

Special thanks to:

Nat Sims MD
Mass General Hospital

John Beard MD
ICU Medical

Summary of key points:

- The medication process in anesthesia is unique in that the anesthesiologist prescribes, dispenses, prepares, administers and documents all medications and fluids.

- Current generation of "Smart" pumps have replaced older pumps that were typically used for drug administration in the OR.

- For inpatient use, bar code medication administration (BCMA) and Smart IV pumps with wireless connectivity are connected seamlessly with the EHR, creating Intelligent infusion systems for auto-programming and auto-documentation.

- Slight modifications to the in-patient BCMA and Smart pump interoperability are required to fit the unique OR infusion and injection practices.

- Technology and software for operating room drug use offer major safety improvement but will require significant practice changes, including use of bar code scanning, documentation before administration, decision support tools, standardization between OR and inpatients, and compliance with the use of the new processes.

Over past 3 decades, multiple infusion pumps designed for Anesthesia have come and gone.

- Primarily syringe pumps for bolus and continuous medication delivery
- IV fluids typically administered via gravity
- Varying degrees of sophistication, safety alerts
- Most were not intended to follow patient after surgery
- Some older devices are still supported, but not by the original manufacturer

Dose Error Reduction System(DERS)

Enhanced Safety for LVP, Syringe, and PCA

Current Smart Infusion Pumps have:

- Fostered the development of drug dose soft and hard limits
- Forced infusion concentration and dosing unit standardization
- Prevented inadvertent programming errors
- Uncovered high degree of variation and unsafe infusion practices
- Provided a "Treasure Trove" of previously invisible infusion practices
- Allowed capabilities and features to be matched with patient care area best practices
- Promoted wireless connectivity for updating libraries, retrieving infusion data, and supporting pumps/EHR interop

Smart Infusion Pumps have not:

- Been associated with the patient receiving the infusion
- Had awareness of the intended therapy
- Prevented drug mix-ups, incorrect drug/concentration selection
- Forced use of the Dose Error Reduction Software (DERS)
- Recorded identity of caregiver/reason for override of limits
- Populated infusion records
- Maximized value of inpatient bar code medication administration (BCMA) systems
- Reduced complexity with the drug shortages

Successful Implementation of the New Paradigm for Medication Safety:
Standardization, Technology, Pharmacy, and Culture (STPC)

by Tim Vanderveen, MS, PharmD, and Sally Graver, MA,

with Jennifer Noped, PharmD; Michael A. Olympio, MD; Betty Petree, CRNA; Sallie Simpson; Frank Sizemore; Melanie Williamson, RN

Medication errors causing harm to patients in the operating room remain a persistent problem. To develop new strategies for "predictable prompt improvement" of medication safety in this setting, the Anesthesia Patient Safety Foundation (APSF) convened a multidisciplinary consensus conference on January 26, 2010. The conference called for a "new paradigm" for future safety efforts to include 4 critical elements: Standardization, Technology, Pharmacy / Prefilled / Premixed, and Culture (STPC).

The recent intravenous (IV) infusion safety initiative at Wake Forest University Baptist Medical Center provides an excellent illustration of how implementing the new paradigm can successfully improve medication safety, clinician satisfaction, and operational efficiency from the operating room to post-operative

ent bulkiness was a concern, and no consensus was reached.

A similarly representative Wake Forest Baptist team visited local hospitals that used various technologies, and then traveled to several medical centers using the modular system. Staff at those medical centers reported that the modular system was effective and easy to use, even in smaller operating rooms, and strongly supported the standardization concept.
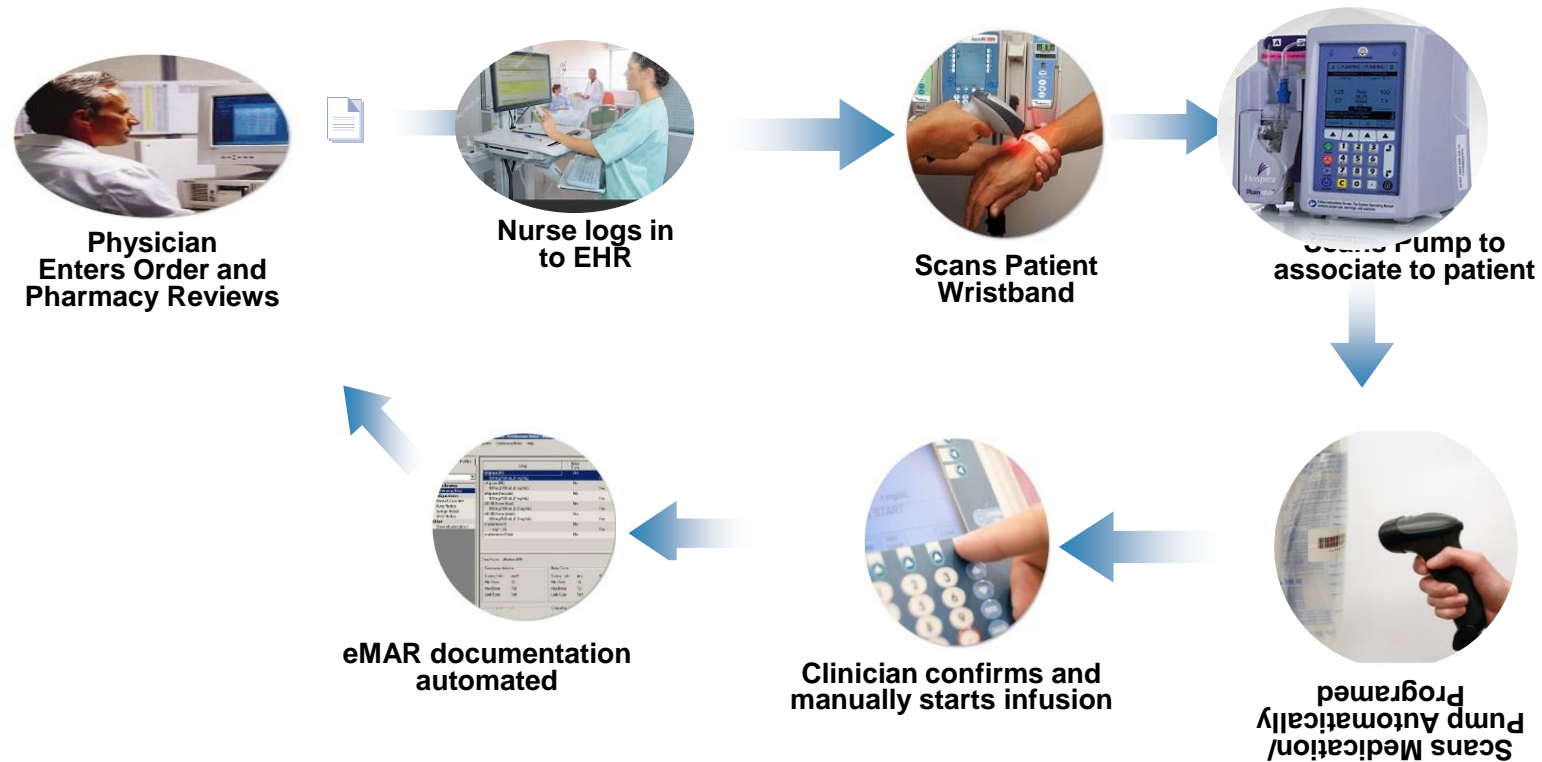
These visits convinced the Wake Forest Baptist team that it could achieve what it wanted to accomplish. Senior leadership was willing to purchase as many pumps as necessary to standardize infusion therapy and prevent hoarding. In May 2009 Wake Forest Baptist announced that the modular IV medi-

Challenges in OR and Opportunities for Improved Infusion Safety

- **Compared to inpatient, No anesthesiologist's medication order and pharmacy review**

- **Frequently there is no bar code label on container**

- **No bar code scan capability in the infusion pump to select the drug/concentration**

- **Selection of the drug and concentration is a manual process <u>if</u> drug library is used**

- **Infusion pumps are primarily used for medications and not fluids**

- **Pumps and infusion concentrations may not be standardized with inpatient pumps/concentrations**

- **The BCMA inpatient medication process does not fit with Anesthesia practice**
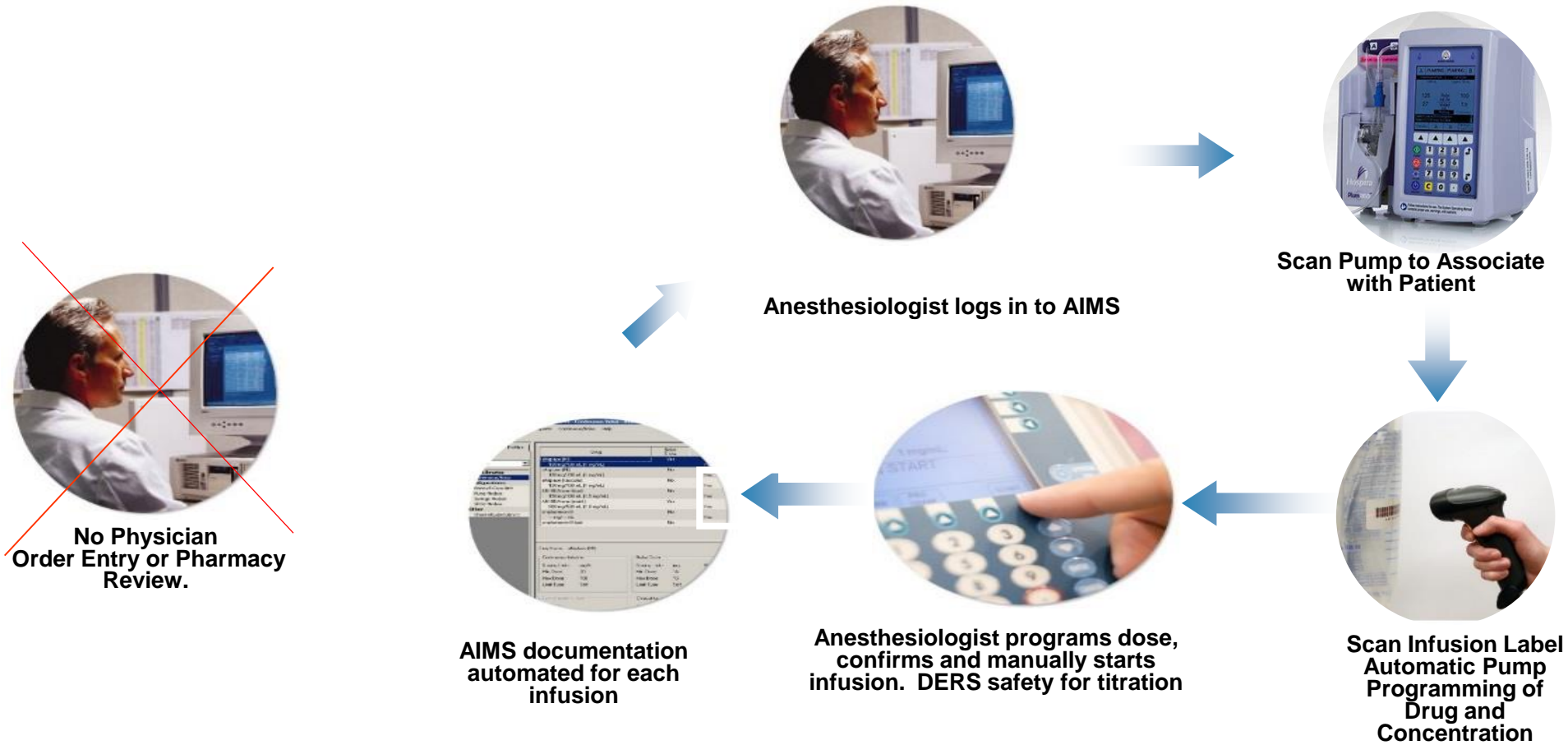
Inpatient Infusion Pump and EHR Interoperability

**Physician
Enters Order and
Pharmacy Reviews**

**Nurse logs in
to EHR**

**Scans Patient
Wristband**

**Scans Pump to
associate to patient**

**eMAR documentation
automated**

**Clinician confirms and
manually starts infusion**

**Scans Medication/
Pump Automatically
Programed**

Taking **Anesthesia** Infusion Safety to the Next Level

Anesthesia/OR Infusion Pump and EHR Interoperability

Anesthesiologist logs in to AIMS

Scan Pump to Associate with Patient

No Physician Order Entry or Pharmacy Review.

AIMS documentation automated for each infusion

Anesthesiologist programs dose, confirms and manually starts infusion. DERS safety for titration

Scan Infusion Label Automatic Pump Programming of Drug and Concentration

IV Injection/Bolus Enhanced Safety Recommendations

ISMP Recommendations:

"...**use barcode scanning or similar technology** immediately prior to the administration of IV push medications **to confirm patient identification and the correct medication.**"

_____

APSF Recommendations:

"**Every anesthetizing location should have a mechanism to:**
1. **Identify medications before drawing up** or **administering them (bar code reader)**
2. **Provide feedback**, **decision support before administration**, and
3. **Documentation (automated information system**).

Safety Technologies to Address Syringe Labelling

Pharmacy compounding

Bulk label Printer

Preprinted Labels

Single Vial/Syringe Label Printer

Commercially prefilled

Outsourced Syringes

CODONICS SLS – Prints Syringe Label and Scans (Wave) to Document to AIMS

- **Supports Anesthesiologist in syringe transfer from scanned vial**
- **Creates JC and ASA compliant labels**
- **Provides audible and visual readout of syringe scanned**
- **Scanner similar to grocery store bar code scanner (does not require hand held scanner)**
- **Capable of documenting to AIMS**
- **Anesthesiologist enters dose, confirms administration**

Injection Identification, Documentation to AIMS

Real-time drug identification

 Opportunity to document before

administration

Facilitates decision support tool

Real-time dose measurement

Real-time allergy alerts

Automatic documentation

Controlled-substance reporting

Antibiotic redosing reminders

BD Intelliport

Specialized Anesthesia Cabinets

ADVANTAGES

- Inventory Control
- Controlled Substance Management
- User Access Control / Security of Medications.
- Workflow Efficiency

CHALLENGES

- Fear of Slowing Down Providers
- Forced by Pharmacy
- Lack of integration to AIMS – Redundancy
- Compliance with use of Cabinets
- Narcotic Waste Management