TALLER INTERACTIVO I

BOMBAS DE INFUSIÓN INTELIGENTES

55 Congreso Nacional S.E.F.H.

Innovación + Resultados

20-21 octubre 2010

Madrid

Vicente Faus Felipe

Área de Farmacia y Nutrición

E.P.Hospital Costa del Sol


wallis
DRESS TO KILL

REPORT

Use of failure mode and effects analysis in improving the safety of i.v. drug administration

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Purpose. Failure mode and effects analysis (FMEA) was used to identify dosing and administration errors associated with i.v. medications and evaluate the effectiveness of subsequent system improvements.

Summary. A multidisciplinary medication safety team conducted an FMEA to identify and reduce common medication errors and selected wrong-dose errors for process improvement. In 2002, wrong-dose errors comprised 17% of all medication errors at the hospital (59 of 347 errors). The most common reason for administering the wrong dose was error in programming the

tions were performed. First, standard order sets were revised after streamlining the formulary and eliminating the use of unapproved abbreviations. Second, an i.v. pump with enhanced safety features was implemented. One-year follow-up data revealed that the number of medication errors related to dosing (wrong dose or incorrect infusion rate) had decreased slightly (from 59 in 2002 to 46 in 2003); however, a dramatic reduction was noted in the percentage of pump-related errors. In 2003, pump-related errors accounted for 22% of dosing errors, compared with

The Institute of Medicine's report on the safety of the health care system confirmed what many practitioners believed—medical errors occur frequently, are costly, and negatively affect patients' quality of life.[1] Medication errors are believed to be responsible for about 7000 deaths each year in the United States. Furthermore, patients who have preventable adverse drug events (ADEs) while in the hospital have increased morbidity, resulting in increased

Causes of Hospitalwide Wrong-Dose Errors in 2002 (n = 59)

Cause of Error[a]	No. (%) Errors
Infusion-pump related	24 (41)
Epidural-pump related	3 (5)
PCA-pump related	3 (5)
TPN-pump related	2 (3)
Drug-concentration related	7 (12)
Oral-dose related	9 (15)
Other	11 (19)

[a] PCA = patient-controlled analgesia, TPN = total parenteral nutrition.

Hazard Analysis of Potential Errors in I.V. Pump Use

Potential Error	Criticality Index[a]
Obtaining medication	133
Layout of automated dispensing system[b]	149
Preparing the infusion	170
Reading the order	191
Programming the pump	246

[a] Index calculated by multiplying the mean rating scores for severity, frequency, and probability of reaching the patient; higher scores represent more critical errors.
[b] Refers to drug placement and arrangement in the cabinet.

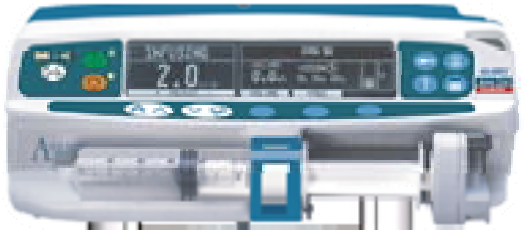
Acute Care
ISMP MedicationSafetyAlert!

MISPROGRAM A PCA PUMP? IT'S EASY!

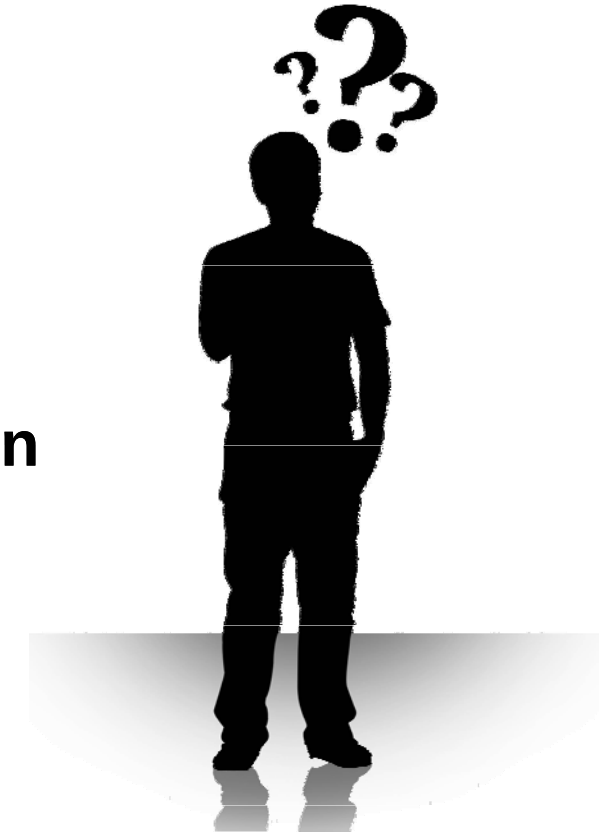
From theJuly 29, 2004 issue

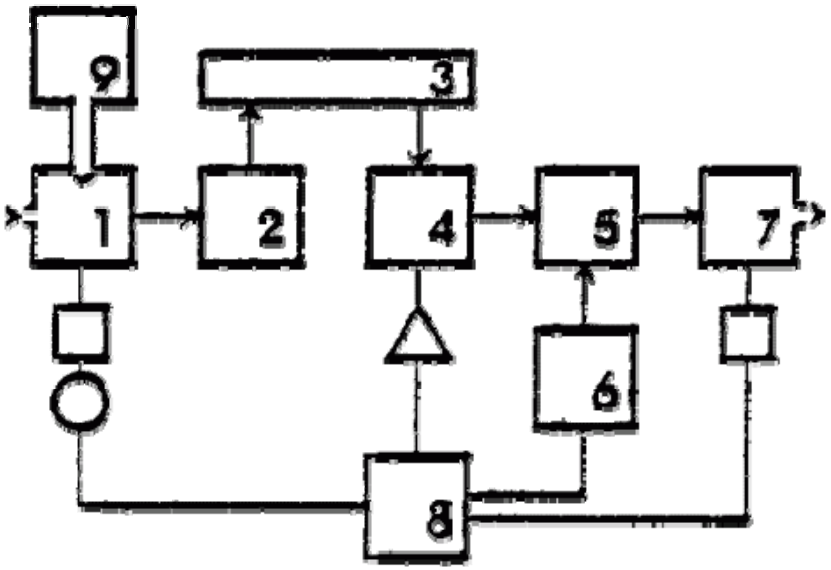
Problem: One patient died and another recovered after two nurses accidentally misprogrammed **Deltec CADD-Prizm PCS Pain Control System** pumps (model 6101) used for patient-controlled analgesia (PCA). But while it's clear that human error played a small role in the mistakes leading up to these events, the real culprit is more likely a variety of system problems, including the pump's unseen default to a prior setting.

Here's what happened: The errors were first recognized when a postoperative patient became unresponsive after a bolus of fentanyl. The physician had ordered fentanyl PCA "per protocol," which called for a 50 mcg/mL concentration, a 10 mcg demand dose, a 6 minute lockout, and clinician boluses of 20 mcg (every 5 minutes x 3, repeat every 4 hours as needed). To program the pump, the nurse first scrolled through a wide range of numbers to select the correct concentration, but she accidentally programmed 1 mcg/mL instead of the actual concentration of 50 mcg/mL. Next, she programmed the demand dose as 0.10 mcg instead of 10 mcg. Two nurses were initially present when the pump was being programmed, but one left to take a phone call. When she returned, she asked the other nurse to read the settings to her for verification, but the programming errors were missed. Since the pump had been programmed to deliver fentanyl in a 1 mcg/mL concentration, each demand dose delivered only 0.1 mL. So, despite an actual concentration of 50 mcg/mL, the patient received only half of the intended dose (0.1 mL of 50 mcg/mL, or 5 mcg). When the patient continued to complain of severe pain, a nurse on the next shift decided to give the patient a 20 mcg bolus. She correctly programmed the bolus dose, but since the pump had been set incorrectly at a 1 mcg/mL concentration, the patient received 20 mL of the 50 mcg/mL concentration, or 1,000 mcg! About 15 minutes later, the patient was found unresponsive and quickly transferred to ICU, but the patient died 3 days later.

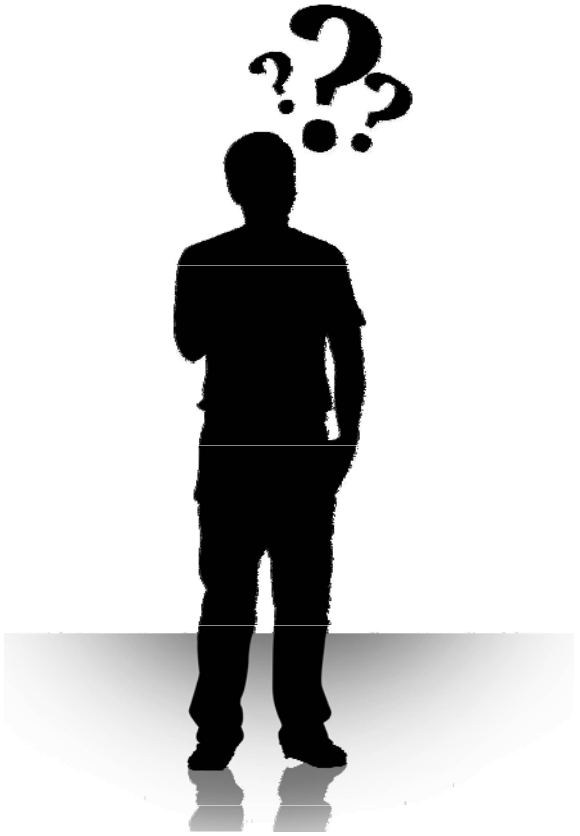


Tenemos las bombas de perfusión
"smart pumps"





...y qué



Inteligente significa:

- Programación y planificación previa
- Necesidad estandarización y coordinación
- Trazabilidad de todos los procesos
- Sistemas de aseguramiento de la calidad

PROGRAMACIÓN:

BIBLIOTECAS DE DATOS

Características de la programación

- Programación y planificación previa
- Necesidad estandarización y coordinación
- Trazabilidad de todos los procesos
- Evaluación de la utilización
- Sistemas de aseguramiento de la calidad

BIBLIOTECAS DE DATOS

Ejemplo de variabilidad de nombre de fármacos

Alteplasa
Activasa
Activasa (tPA)
alteplasa
alteplasa (tPA)
alteplasa (Activasa)
TPA (alteplasa)
alteplasa – ataque
alteplasa – dosis baja
ALTEPLASA (mg/kg/hr)
alteplasa en goteo
alteplasa (tPA) en bolo

+34 OTROS…

Ejemplo de variabilidad en unidades de dosis

Sulfato magnésico
gramos/h
gramos/kg/h
gramos/min
mcg/kg/h
mEq/h
mEq/kg/día
mEq/kg/h
mg/h
mg/kg/h
mg/min

** Fuente: Cardinal Health, Productos Alaris; audit de protocolos de fármacos en 90 hospitales, 2004*

Características de la programación

- Perfiles por **servicios**

UCI

URGENCIAS

NEONATOS

Características de la programación

- **Parámetros generales** de utilización:
  - Alarmas de sonido
  - Dosis por defecto
  - Presión máxima admisible
  - Unidades de medida

Características de la programación

- **Parámetros** de utilización **por fármaco**:
  - Concentración
  - Unidades
  - Límites blando (inferior y superior)
  - Límites duros (inferior y superior)

Proceso de definición de la biblioteca de datos

1. Establecer un **procedimiento** para su diseño

- Grupo de trabajo
- Características propias de servicios
- Definir y difundir consecuencias uso incorrecto
- Establecer un calendario de actualizaciónes y análisis de datos pragmático
- Liderazgo de Farmacia

Proceso de definición de la biblioteca de datos

2. **Estandarizar** y limitar el número de concentraciones

- Consenso intra-servicio (e inter-servicio opcional)
- Utilizar preferentemente diluciones comerciales
- Estandarizar todo
  - Definiciones de tipo de administración
  - Unidades de medida
  - Diluciones (→ adquisicones de fármacos)
  - Simplificar número de concentraciones distintas de un mismo fármaco (máx. 2 distintas)
  - Conciliar protocolos de Prescripción, aplicaciones de farmacia, etiquetado

Proceso de definición de la biblioteca de datos

3. Asegurar **comunicación**

   - Modificación y detección de problemas a tiempo
   - Información de los cambios de manera efectiva

4. Establecimiento de **límites** de medicación

   - Evitar exceso de alertas (límites blandos)
   - Partir de límites elevados e ir afinando
   - Utilizar retroinformación de uso
   - Preveer traslados de pacientes entre unidades

     Urgencias→Qx→UCI

BIBLIOTECAS DE DATOS

- Pediatrics/NICU/Nursery
  - Drug concentrations may differ from adult care areas
  - Lack of commercially-available standardized products
  - Weight and age ranges for pediatrics are wide and may require more than one standard concentration for some drugs
  - Doses are administered in small amounts – device with syringe capabilities will be required
  - Patients often are fluid restricted

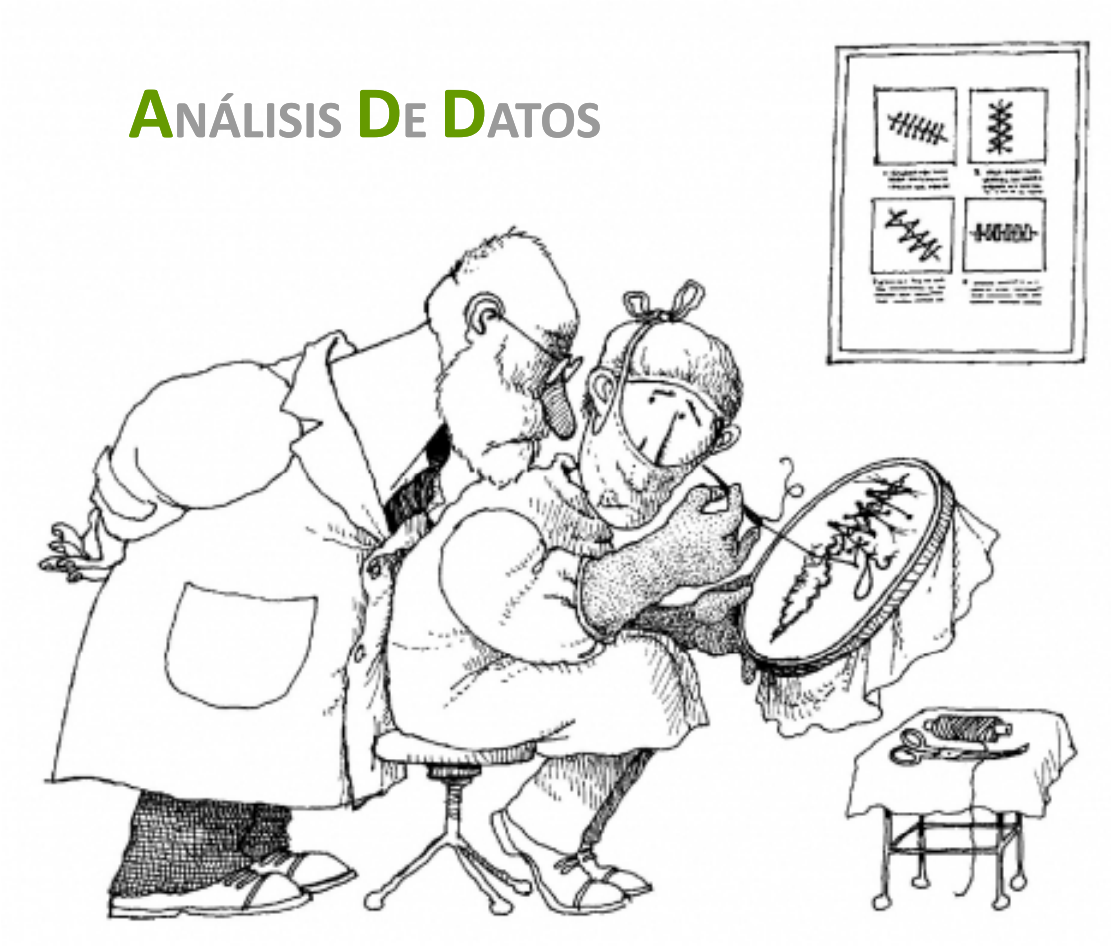
- Pain Management
  - IV patient-controlled analgesia (PCA)
  - Epidural PCA
  - Continuous infusions

- OR/PACU
  - Anesthesiologists must be part of the implementation plan in these areas
  - Medications, concentrations, and specific doses may be administered in these areas that should never be used in other patient care areas

- Oncology
  - Sequential chemotherapy regimens may require additional planning
  - Doses vary based on different protocols

- ED
  - Combination of adult and pediatric populations
  - May need access to multiple libraries

ANÁLISIS DE DATOS



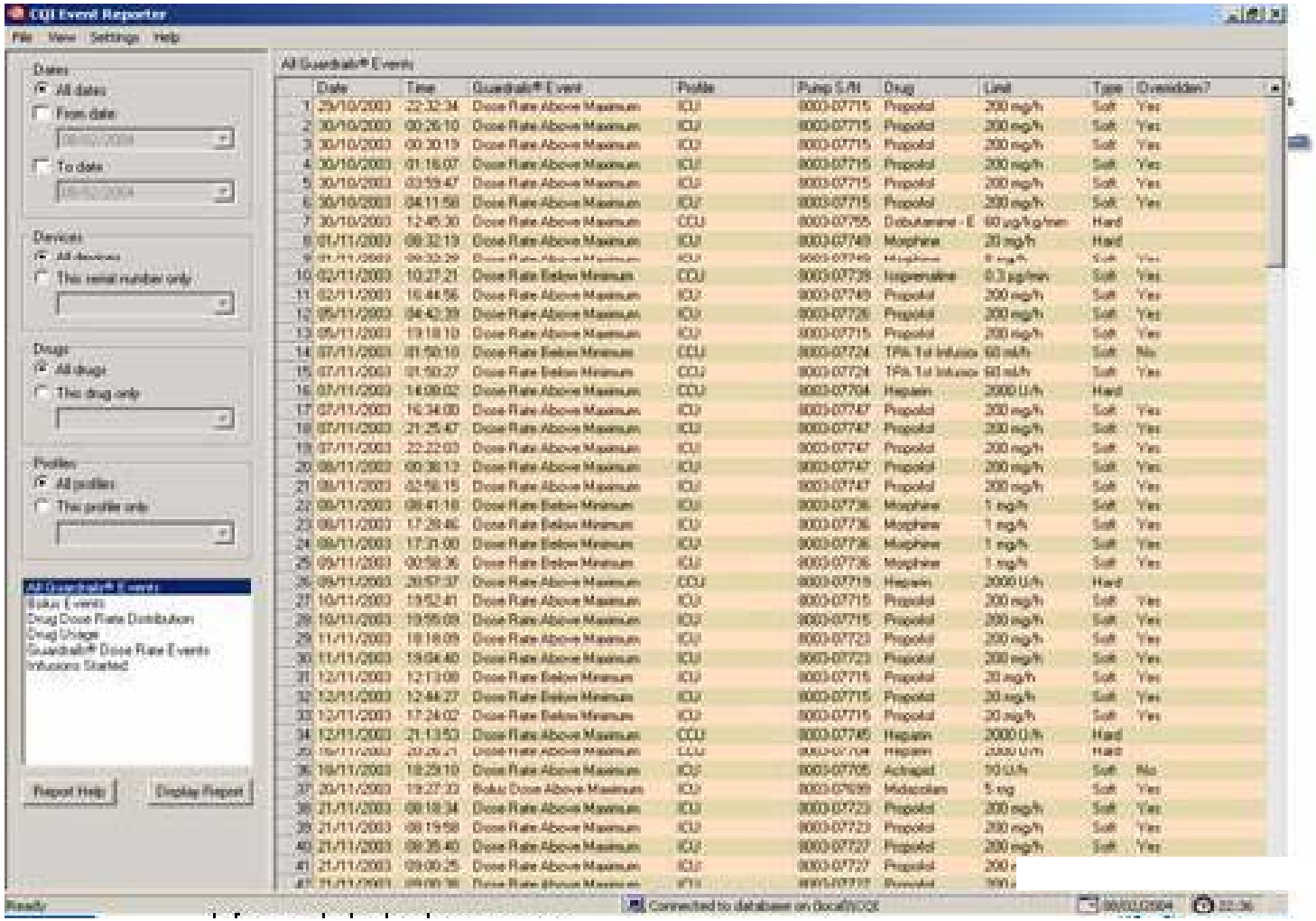
ANÁLISIS DE DATOS

Dopamina programada a 31 ug/kg/min
Excede el ***límite suave*** definido por el hospital de 30 ug/kg/min. El clínico puede puentearlo

El clínico puentea el ***límite suave***
Flechas indican que infusión supera ***límite suave***

El clínico ajusta la infusión a 60 ug/kg/min.
Excede el ***Límite Fuerte*** definido por el hospital de 50 ug/kg/min. El clínico **no** puede puentearlo

ANÁLISIS DE DATOS



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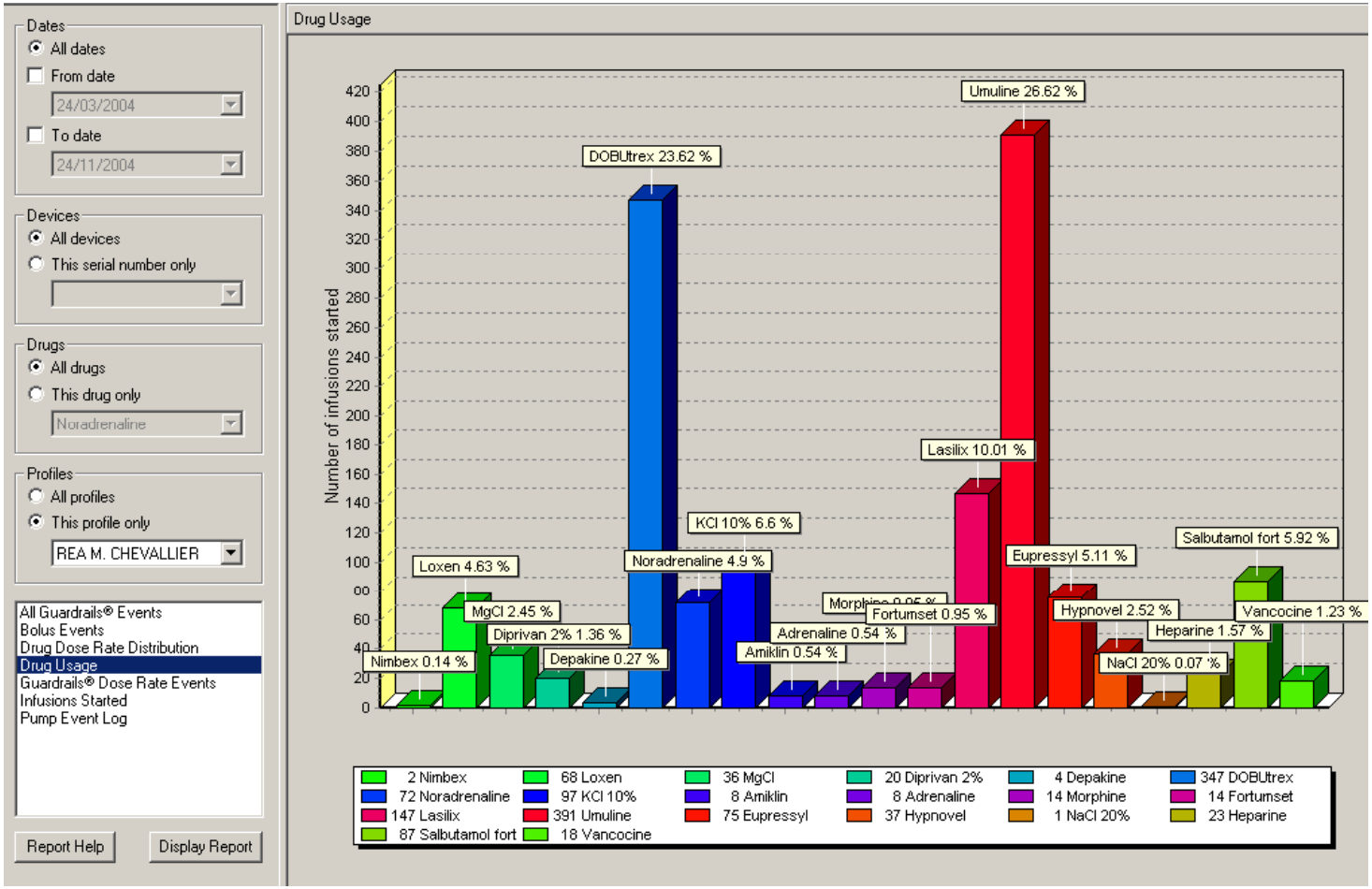

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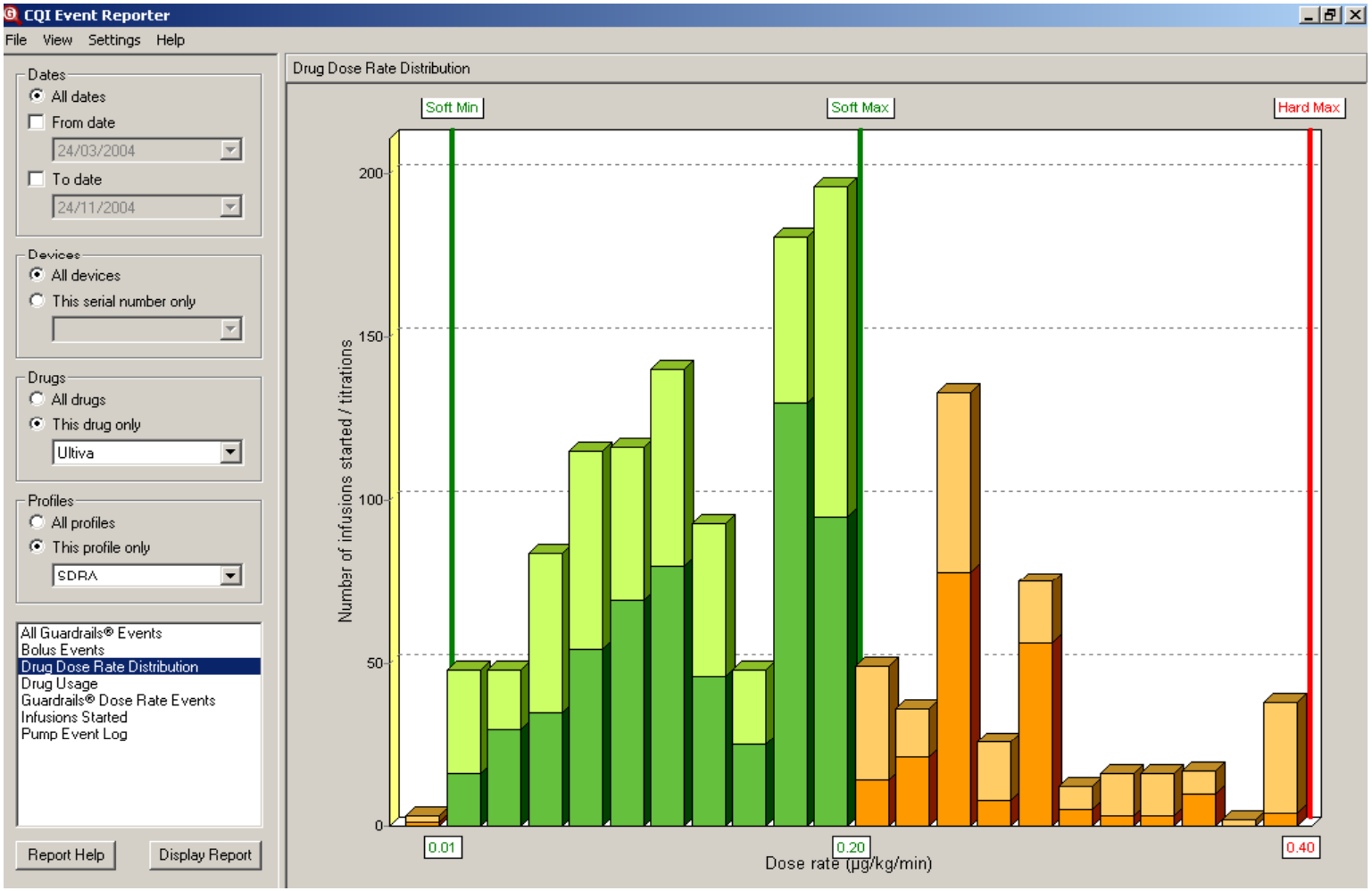

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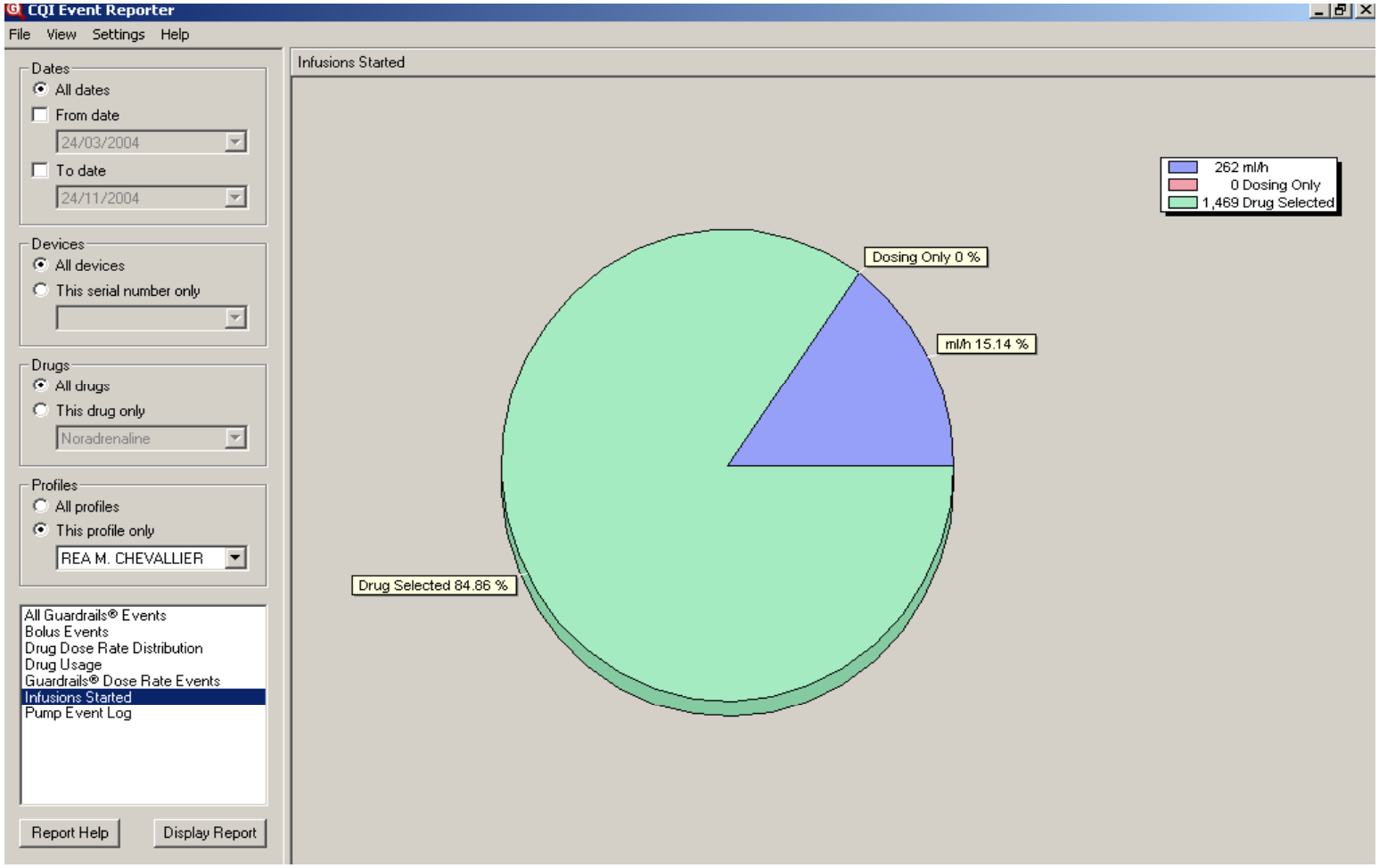

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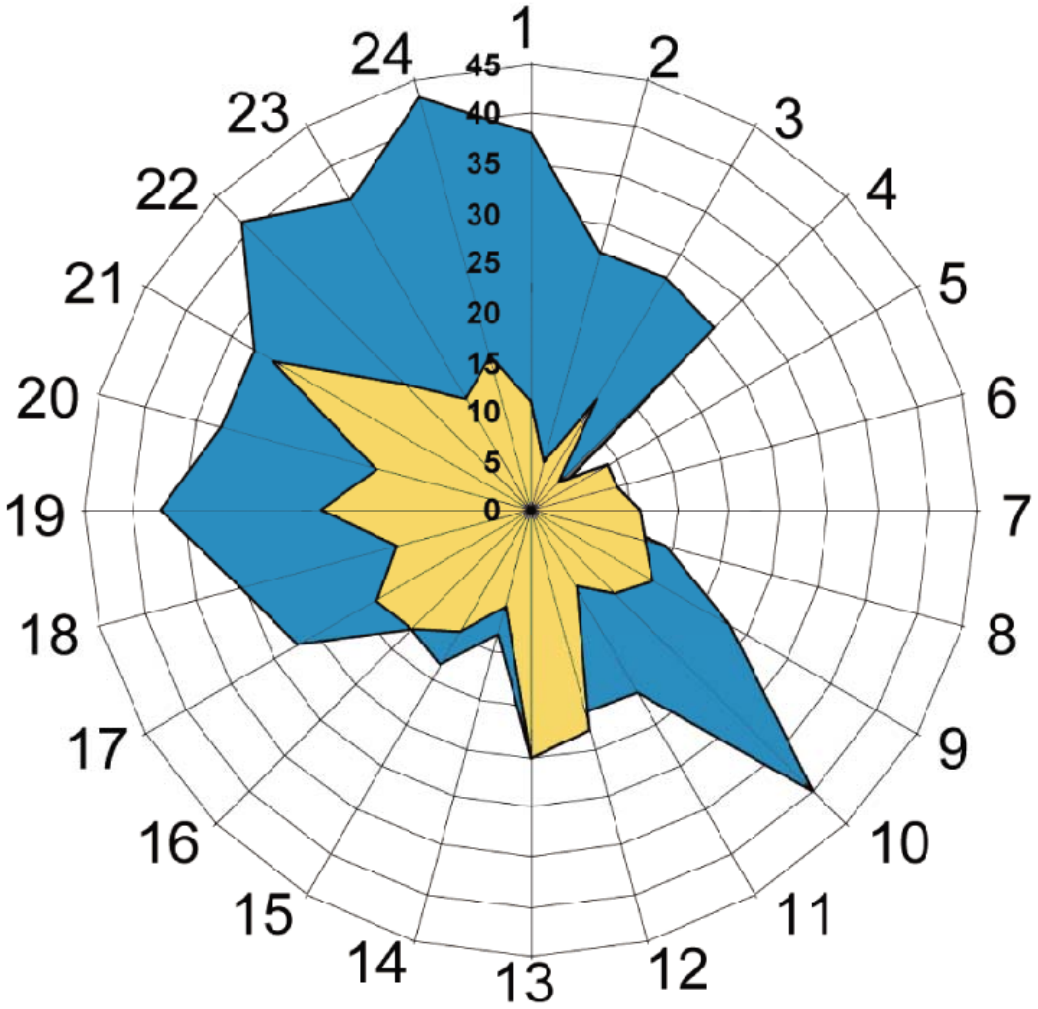
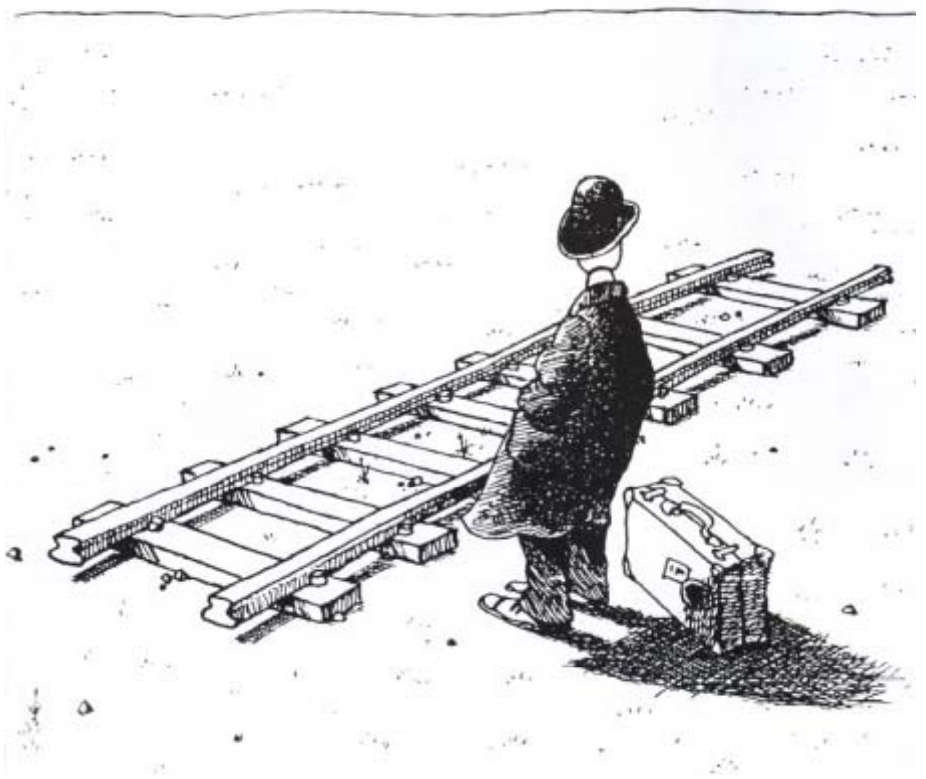
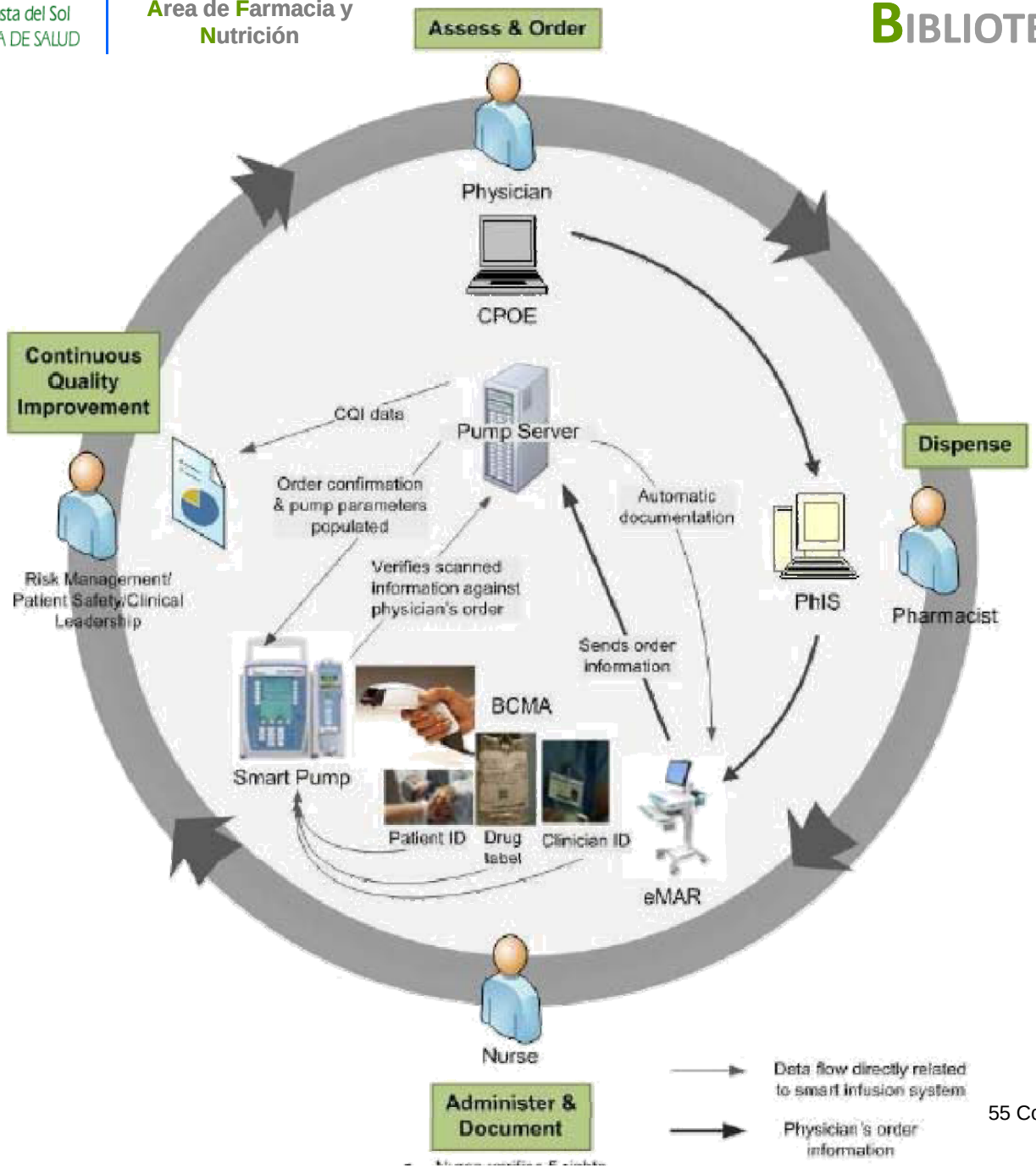


INTERCONECTABILIDAD DE SISTEMAS



BIBLIOTECAS DE DATOS



GRACIAS

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