



Closed Loop of Medication a successful way to drug safety

Dr. Christian Taube

CEO UKE Consult und Management GmbH

XI. Symposium Hospital Management
2nd and 3rd of November 2018, Shanghai

What is Closed Loop Medication Administration ?

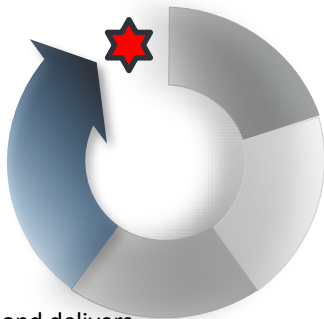
A truly closed loop medication administration system is designed to feed outcomes from medication processes back into the system to allow for the future improvements and changes in a patient's course.

Source: Closing the Loop in Medication Management, Amalga Hospital Information System, April 2009

5. Physicians monitor patient response for follow up

4. Nurses administer the medication

3. Pharmacy processes and delivers patient related medications



1. The medication order originates with the physician

2. The pharmacist receives and validates the electronic order

Modified from:
Closing the Loop in Medication Management, Amalga
Hospital Information System, April 2009



Why do we need Closed Loop Medication Administration ?

1 Mio. admissions due to adverse drug events (ADE)
per year¹

20% (200.000) thereof due to medication errors¹

12.000-24.000 deaths/year due to ADE¹

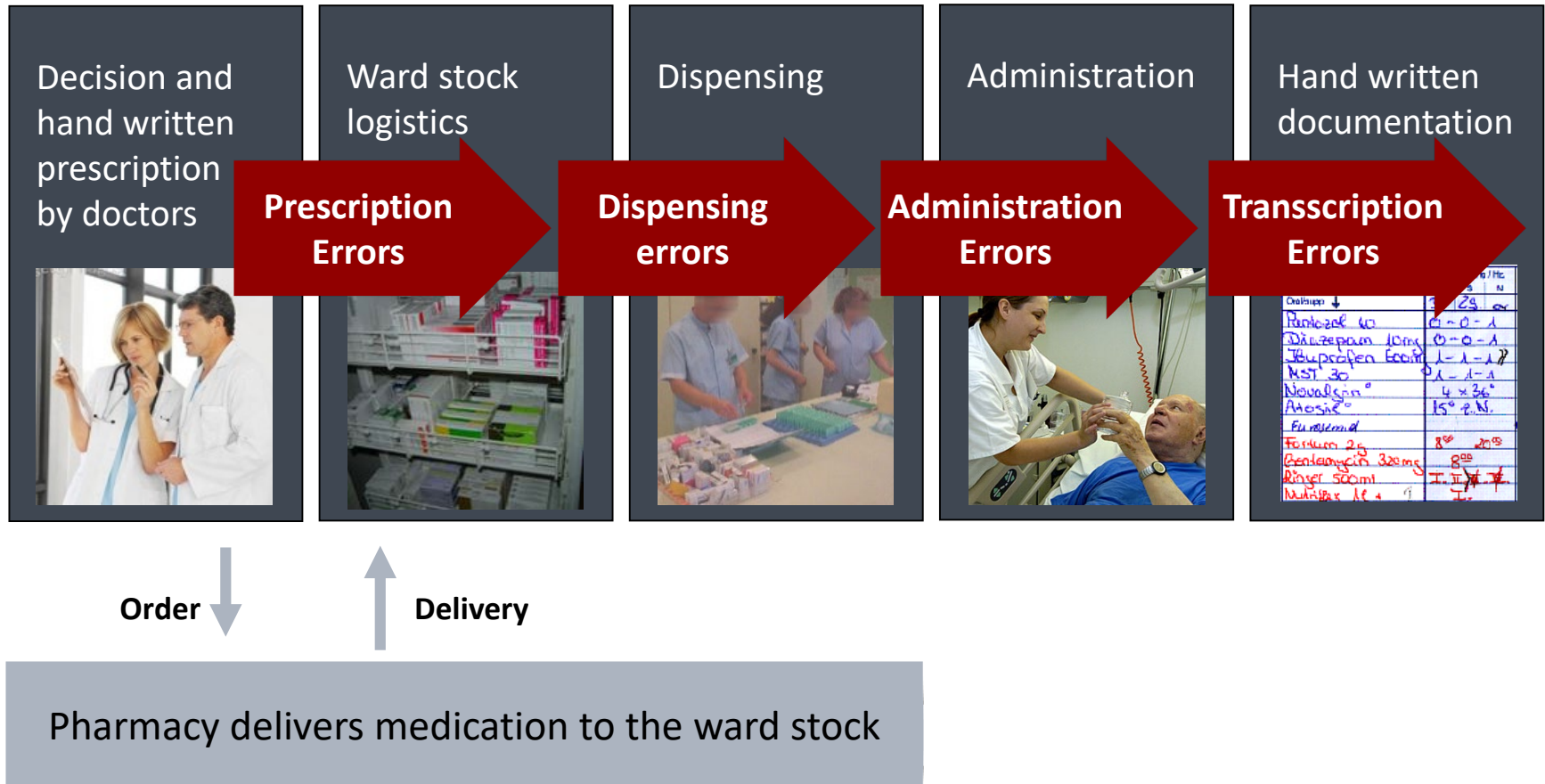
After risk of infection, medication errors are the
biggest risk for patients in the hospital²

Sources:

(1) Amin-Farid Aly, K Boldt –ADKA Aachen 2016

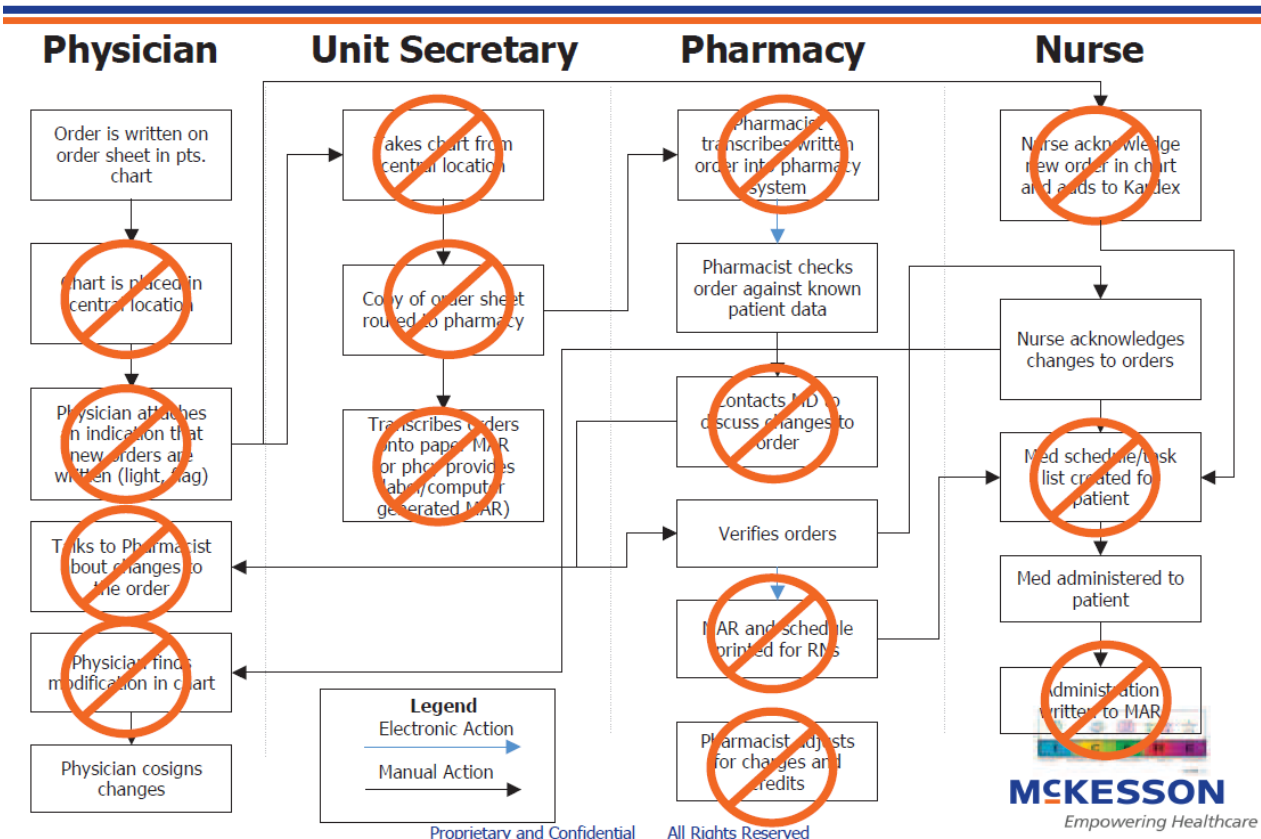
(2) von Eiff (2011)

The traditional paper-based medication process



Complexity of medication process

Eliminate Steps using Electronic Medication Order Processing



Source: Bryan Eckert, McKesson Nov. 2003

Medication Process at UKE

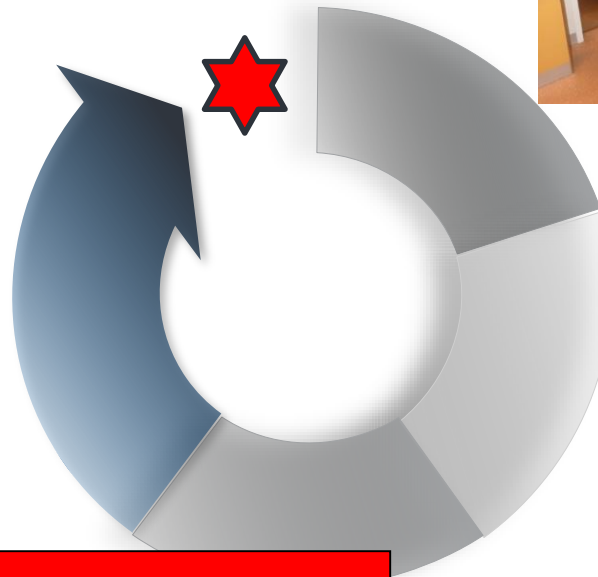


CPOE
at bedside via
Soarian platform

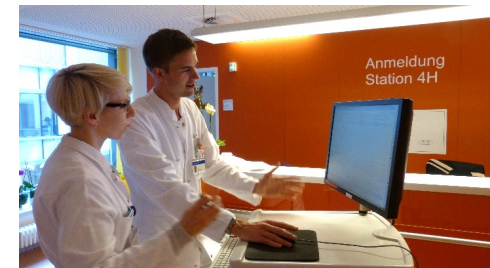
A screenshot of a medication administration system (Soarian) interface. It shows a list of medications on the left and a grid for recording administration times and status (green for given, red for not given) on the right.

Medication	07:00	08:00	09:00	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	24:00
Aspirin 100mg																		
Paracetamol 500mg																		
Insulin 100 U/ml																		
Antibiotic 500mg																		
Antacid 200mg																		
Anticoagulant 5mg																		
Antidepressant 150mg																		
Antiepileptic 100mg																		
Antihypertensive 10mg																		
Antipsychotic 5mg																		
Antiviral 1000mg																		
Antacid 200mg																		
Anticoagulant 5mg																		
Antidepressant 150mg																		
Antiepileptic 100mg																		
Antihypertensive 10mg																		
Antipsychotic 5mg																		
Antiviral 1000mg																		

registration of
administration



Unit dose
production
by pharmacy



Pharmacy validation
on the ward

**Doctors
determine
the final**

- **medication**
- **dose**
- **route**
- **precise time**

**After prescription
medication order
needs pharmacy
validation to initiate
the logistic process**



CPOE
at bedside via
Soarian platform

Doctors can access
any relevant patient
data directly while
prescribing.



ID Pharma check
Double order
Drug-drug
interaction
Allergy check
Dose adoption

....

Pharmacy validation

Pharmacy validation comprises:

- ➔ medication reconciliation
- ➔ allergy check
- ➔ interaction counseling
- ➔ dosage check and adjustment
- ➔ early change to oral medication
- ➔ implementation of guidelines
- ➔ ...

Pharmacists have an **unlimited access** to all patient relevant data (clinical chemistry, microbiology...)



CPOE
at bedside via
Soarian
platform



Pharmacy validation
on the ward

Unit-dose production

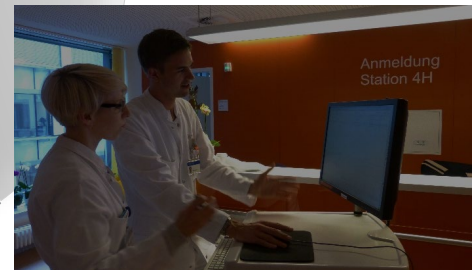
**The final link
between
medication and
patient is fixed
automatically
by pouch
production in
the pharmacy**



**Production
of unit-
doses in the
pharmacy**



**CPOE
at bedside via
Soarian
platform**



**Pharmacy validation on
the ward**

Unit-dose production



Unit-dose production

Unit-dose medication is individually labelled with:

- patient name
- ward, room
- medication, dose, route
- date and time
- advice for administration
- complete drug information via QR-Code



Unit-dose supply

Two deliveries a day:

- main delivery
 - status after main ward round
 - contains all medications for the next 24 h starting with 6pm
- second delivery
 - contains latest changes between main ward round and 4 pm
- additional deliveries
 - only small amounts if urgently needed by tube system



Documentation of administration



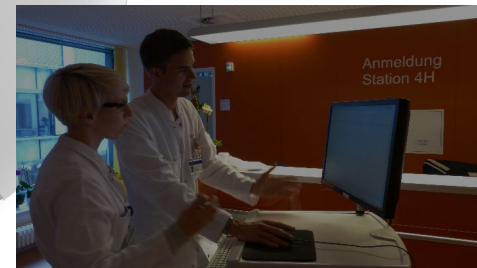
CPOE
at bedside via
Soarian
platform

Medication	08:00	12:00	18:00	22:00
Aspirin 100mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Paracetamol 500mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Insulin 10U	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antibiotic 500mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antacid 200mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Diuretic 20mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Anticoagulant 5mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antidepressant 10mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antipsychotic 5mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Antiepileptic 100mg	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

registration of
administration



Production of
unit-doses in
the pharmacy



Pharmacy validation on the
ward

Paper based documentation

Dat.	Arztliche Anordnungen Medikamente IV	Uhrzeit ↓ ↑	HZ Vorbereitung PP	HZ Vorbereitung PP	HZ Vorbereitung PP	HZ Vorbereitung PP	HZ Vorbereitung PP	HZ Vorbereitung PP	HZ Vorbereitung PP
	Zugang spülen 3x2ml mit NaCl 0,9%		3x2ml	3x2ml	3x2ml	3x2ml	3x2ml	3x2ml	3x2ml
	Cefuroxim 3x14 ⁸ lcl (200mg/kg lcl)		2x1g	2x1g	2x1g	2x1g	2x1g	2x1g	2x1g
	Neo Preemmen 20cc IF Mo Ki FH 18° D.C.		20cc IC	20cc IC	20cc IC	20cc IC	20cc IC	20cc IC	20cc IC
	Mordilthopim 15mg/200ml Lanx IgG-Präparat (Infusor)		15mg	15mg	15mg	15mg	15mg	15mg	15mg
	CH-B VERB. 05 5337		LE05G0708A 05/0004						
	CH-B.1 LE05H005AV VERB. BIS: 12/2009 LE-07-00004								
	Lösung 1/2 Gefäßspülung		1,5%	30std.	420ml				

Documentation with Closed Loop Medication Administration

Medikationsübersicht

Musterfrau, Malene (*17.07.1964), 50 Jahre, weiblich

Hinweise

Zeitraum: 06.05.2015 (00:00 Uhr - 23:00 Uhr) Heute
 Ansicht: 24 Stunden

	<<	30.04. (Do.)	01.05. (Fr.)	02.05. (Sa.)	03.05. (So.)	04.05. (Mo.)	05.05. (Di.)	06.05. (Mi.)	07.05. (Do.)	08.05. (Fr.)	09.05. (Sa.)	10.05. (So.)	11.05. (Mo.)	12.05. (Di.)	13.05. (Mi.)	>>										
	<<	00:00	01:00	02:00	03:00	04:00	05:00	06:00	07:00	08:00	09:00	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	>>

Handelsname / Wirkstoff

- intravenös

Human-Albumin 20% 50ml INF - (P)
 (CHARGE)

Human-Albumin 20% 50ml INF - (P)
 (CHARGE)

Meropenem Eberth 500mg TRS - (P)
 1-0-1 Flasche; 1-0-1 Flasche

Sterofundin ISO 500ml Ecoflac Inf. - (S)
 ... ; ... ; 1-0-1 Flasche

Vancomycin 500mg TRS - (P)
 X-0-0 Flasche; ... ; X-0-0 Flasche

- subcutan

Actrapid 100 IE/ml Amp - (S)
 X-0-0 I.E.

Lantus Insulin 100IE/ml Amp - (S)
 0-0-28 E.

- peroral/oral

Bifiteral Sirup - (S)
 30-30-30 ml

Citalopram Hexal 40mg FTA - (A)
 1-0-0 Tabl.

Decortin H 10mg Tab - (A)
 1-0-0 Tabl.

Decortin H 5mg Tab - (A)
 1-0-0 Tabl.

Dekristol 20.000 IE Kps - Intervall beachten - (A)
 Mo 1-0-0 Kaps.

Epivir 150mg FTA - (A)
 1-0-0 Tabl.

Ferro Sanol Duodenal (Fe2+) 100mg Kps - (A)
 ... ; 08:00 1 Kaps.

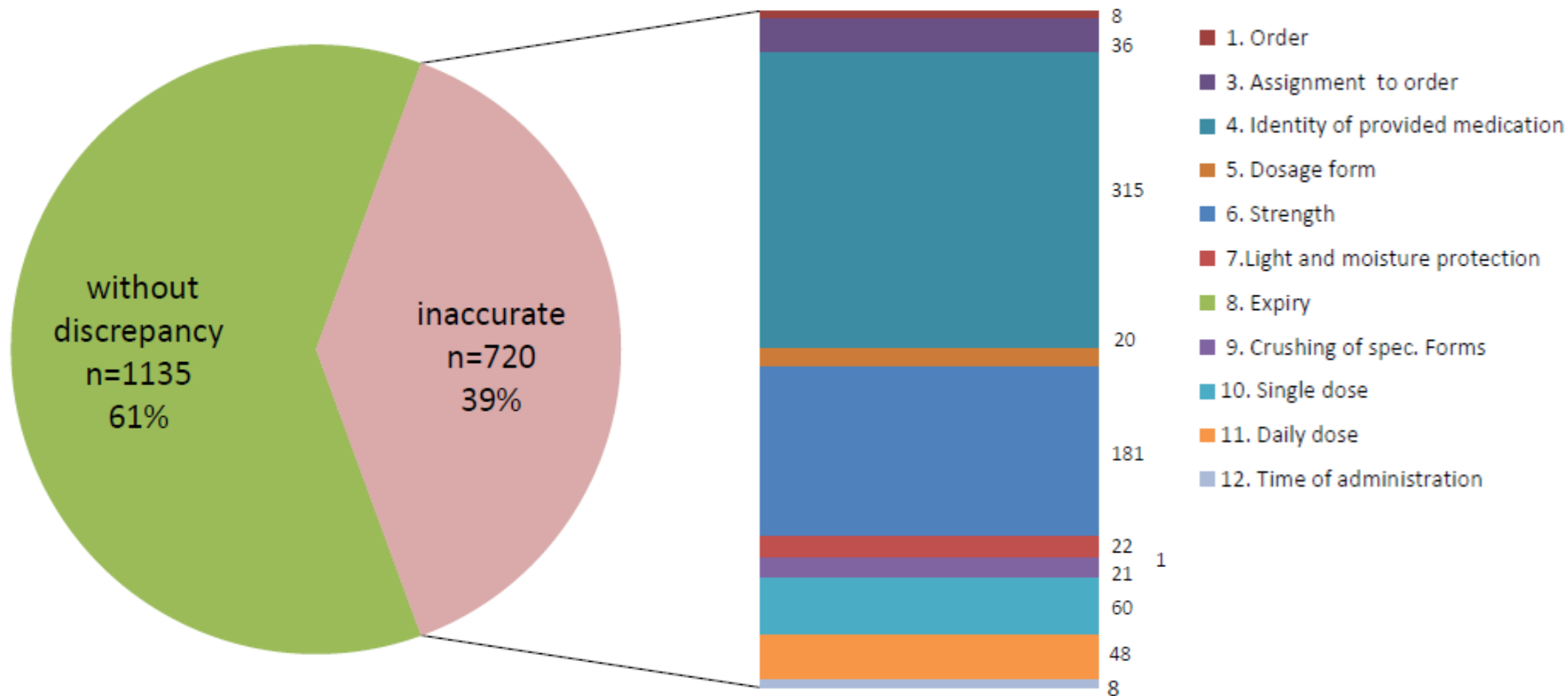
Kompakte Ansicht

									1 Flasche																
													2 Flasche						2 Flasche						
									1 Flasche										1 Flasche						
									1 Flasche																
									X Flasche																
									X I.E.																
																			28 E.						
									30 ml										30 ml						
									1 Tabl.																
									1 Tabl.																
									1 Tabl.																
									1 Tabl.																

+ Neue Verordnung

CPOE without unit-dose supply

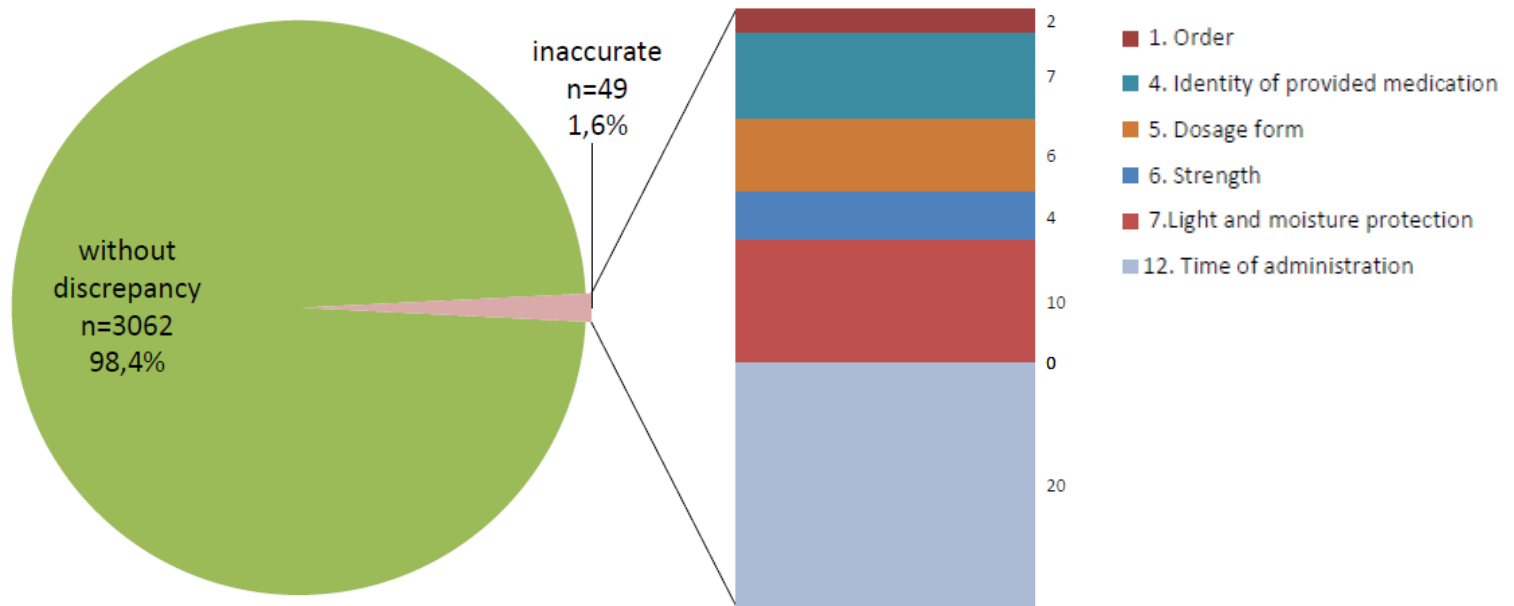
University Medical Center of Freiburg



according to Groth-Tonberge C, Häckh G, Strehl E, Hug M Krankenhauspharmazie 33:476-479 (2012)



Increased medication safety

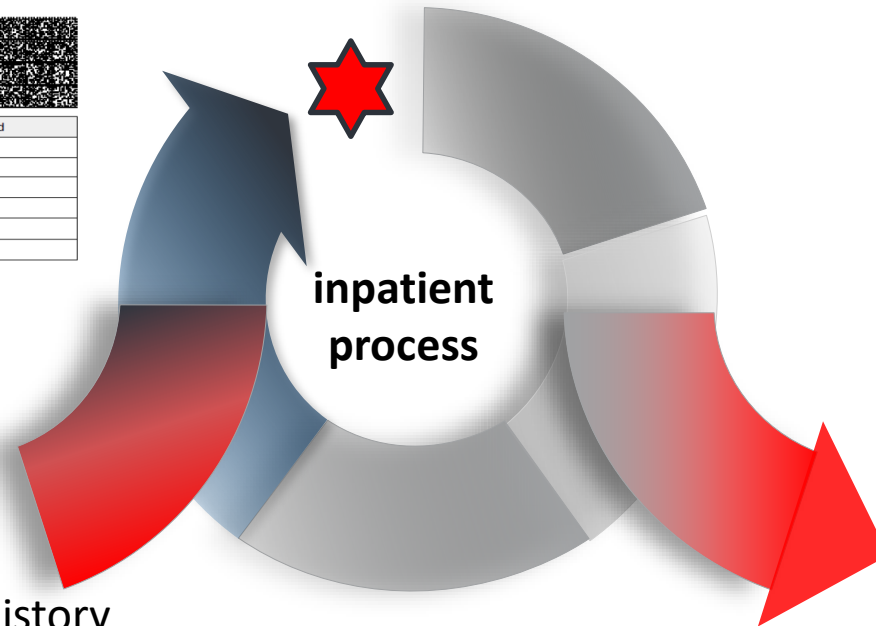
CPOE combined with unit-dose supply University Medical Center Hamburg Eppendorf



Baehr M, van der Linde A, König R, Melzer S, Langebrake C, Groth-Tonberge C, Hug MJ. Kopplung von elektronischer Verordnung und patientenorientierter Logistik - Signifikante Verbesserung der Arzneimitteltherapiesicherheit. KHP 35:110-117 (2014)

Easy management of admission and discharge interfaces

Medikationsplan				für: Test Patientensicherheit T3-Soarian				geb. am: 14.12.1936			
Seite 1 von 1				ausgedruckt von: Testarzt Musterstraße 49, 20246 Musterort Tel.: 040/7410 E-Mail: test@uke.de				ausgedruckt am: 10.09.2015			
											
Wirkstoff	Handelsname	Stärke	Form	Mo	Mi	Ab	zN	Einheit	Hinweise	Grund	
Enoxaparin natriu...	Claxane 40mg/0.4ml FSP - (P)	40mg...	Spritze	0	0	1		Dosiersp.			
Acetylsalicylsäure	ASS-ratio 100mg Tab - (A)	100mg	Tabl	1	0	0		Stück			
Enalapril maleat	Enalapril-ratio 10mg Tab - (A)	10mg	Tabl	1	0	1		Stück	unabhängig von den Mahlzeiten.		
Metoprolol succin...	Metohexal Succ 47.5mg RET - (A)	47.5m...	RetTabl	0	0	1		Stück	während der Mahlzeiten.		
Metoprolol succin...	Metohexal Succ 95mg RET - (A)	95mg	RetTabl	1	0	0		Stück	während der Mahlzeiten.		
Simvastatin	Simvahexal 40mg FTA - (A)	40mg	Tabl	0	0	1		Stück	unabhängig von den Mahlzeiten.		



Admission

- Medical history
- Automatic conversion to hospital formulary
- Admission medication order

Discharge Management

- Doctor Letter
- Medical history
- Discharge recipe



Thank you for your attention



A subsidiary of



Certified according to
DIN EN ISO 9001:2008

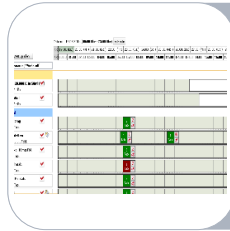


UKE Consult und Management GmbH
Martinistraße 52
D-20251 Hamburg

Dr. Christian Taube, MBA
CEO

phone: +49 (0) 40 7410-56810
fax: +49 (0) 40 7410-57598
ucm@uke.de
www.u-c-m.de

Medication Process at UKE



registration of
administration



CPOE at bedside
via Soarian
platform

The final link
between
medication and
patient is fixed
automatically by
pouch
production in the
pharmacy



Administration



Pharmacy
validation
on the ward



Unit dose
production
by pharmacy