

# Systematics and challenges of medicines reconciliation



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epidemiologist

# Conflict of interest

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Nothing to disclose



# Medication is the

most commonly used intervention/treatment



yet we lack the overview...

# Case: 75 year old woman

- Infection after surgery
- Gentamicin prescribed (stop at discharge)
  - Discharge list prepared by nurse
  - Dr. on vacation, another doctor covering

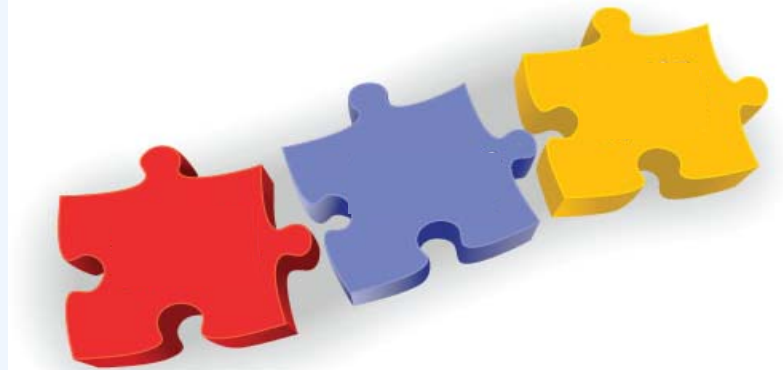


# Case: 75 year old woman

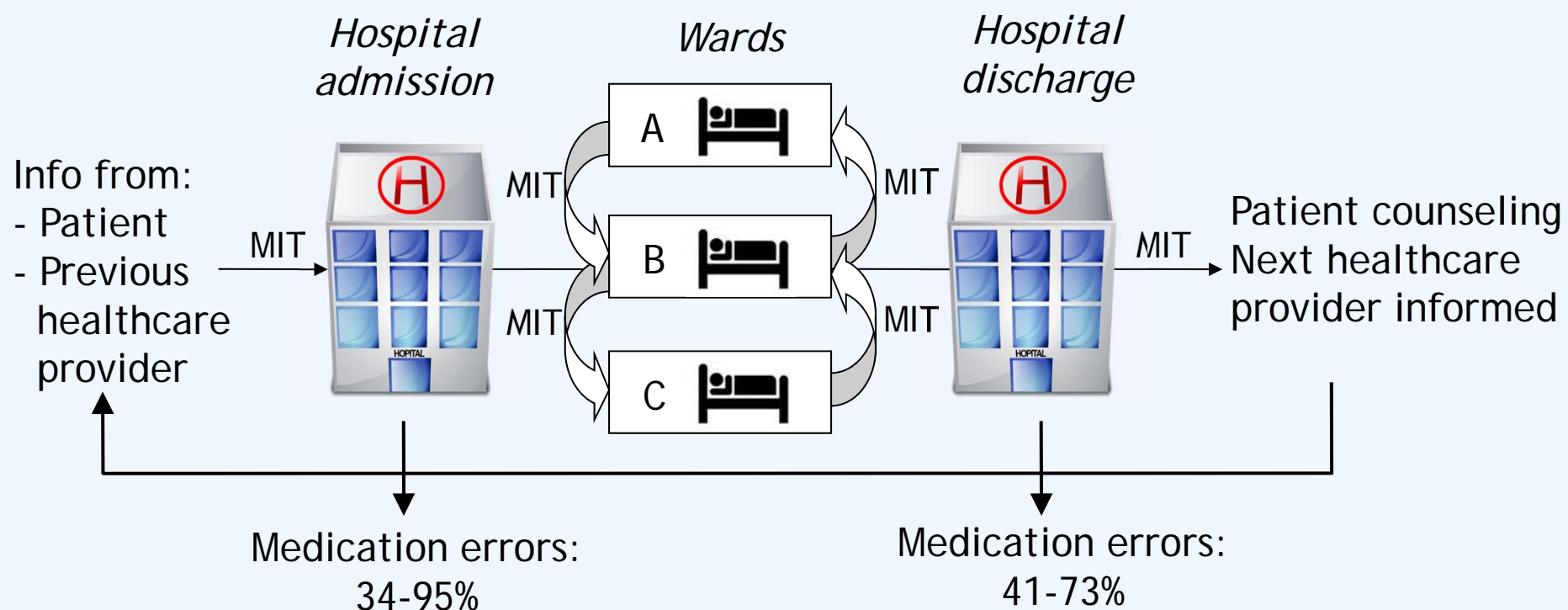
- Infection after surgery
- Gentamicin prescribed (stop at discharge)
  - Discharge list prepared by nurse
  - Dr. on vacation, another doctor covering
- Nursing home: continued drug
  - Three days later: trouble urinating
  - Serum creatinine: “abnormal high” levels
  - Test repeated: next day even higher
- Renal failure: permanent, requiring dialysis
  - The patient sued: \$3.2 million in damages

# Continuity of care

- = continuum of care = seamless care etc.
- “the degree to which a series of discrete healthcare events is experienced as coherent and connected and consistent with the patient's medical needs and personal context”



# Continuity of pharmaceutical care



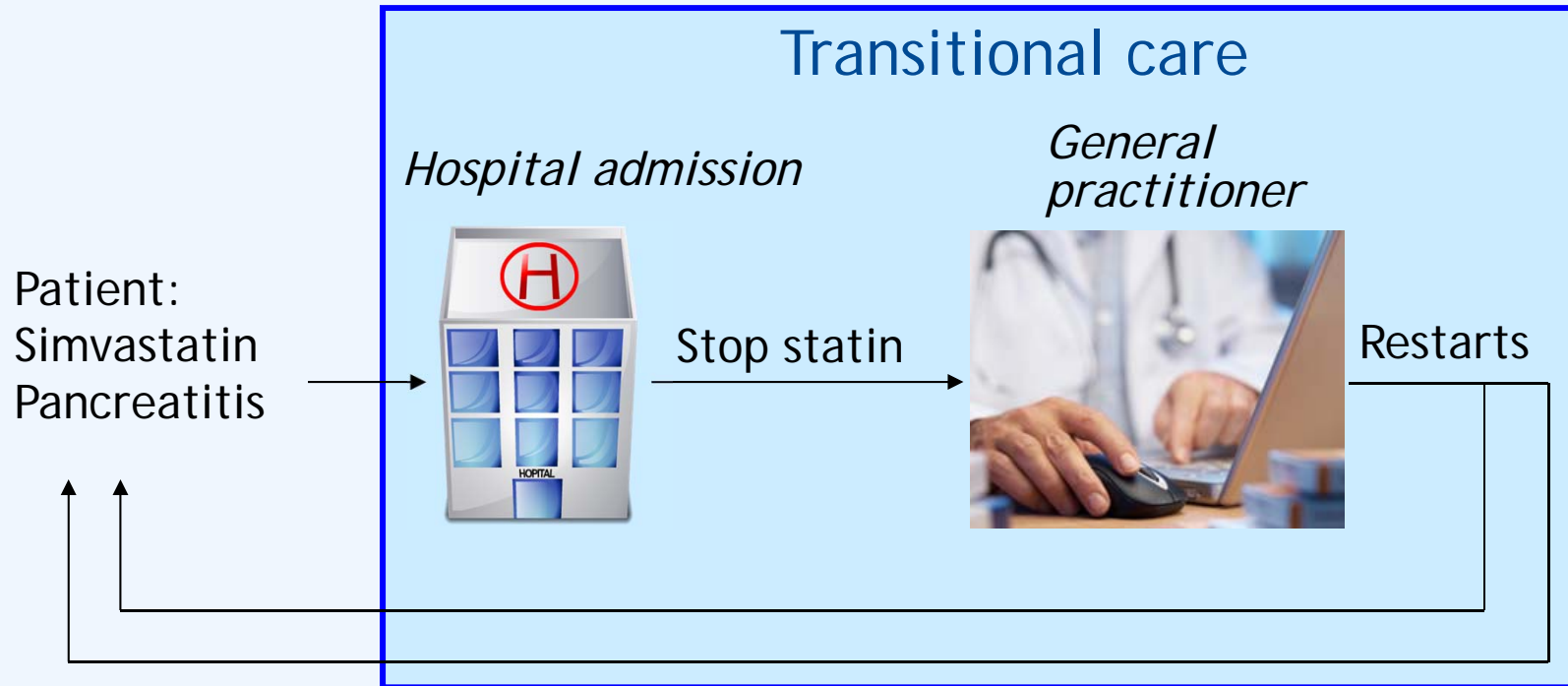
## Medication reconciliation

MIT= medication information transfer

Tam VC, et al. CMAJ. 2005 Aug 30;173:510-5. Schnipper JL, et al. Arch Intern Med 2006;166:565-71.  
Wong JD, et al. Ann Pharmacother 2008;42:1373-9. Karapinar F, et al. Ann Pharmacother 2009;43:1001-10.



# Case



Transitional care = set of actions to ensure continuity of health care as patients transfer between different locations or different levels of care

- Croonen H. A new generation medication surveillance is needed. Dutch Pharmaceutical Journal 2006.
- Joint Commission on The Accreditation Of Healthcare Organizations. Medication Reconciliation Handbook. ASHP; 2006.
- Van der Linden CM et al. Represcription after adverse drug reaction in the elderly: a descriptive study. Arch Intern Med. 2006;166:1666-7.

# Key messages



## Medication reconciliation

- Not just simply matching medication lists
- Patients/carer: the only constant factor
- There is no continuity in one setting or one person/profession: train and delegate
- Use electronic records but be critical

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# Medication reconciliation

“The process of creating the most accurate list of medications at all transition points, with the goal of providing correct medications”



- IHI. Protecting 5 million lives from harm. Getting started kit: prevent adverse drug events (medication reconciliation).
- Joint Commission on The Accreditation Of Healthcare Organizations. Medication Reconciliation Handbook. ASHP; 2006.

# Medication reconciliation: 4 steps

- Verification: compare medication lists
  - Previous vs actual list: collect accurate medication history



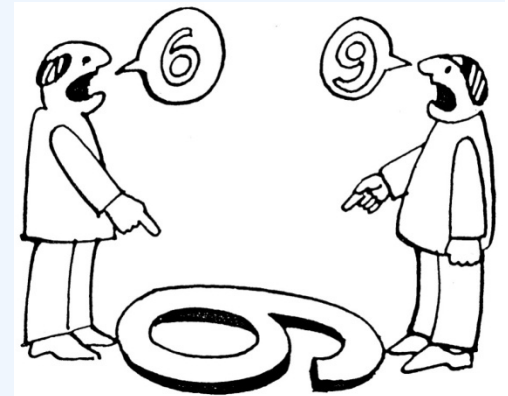
- IHI. Protecting 5 million lives from harm. Getting started kit: prevent adverse drug events (medication reconciliation).
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- Clarification: check appropriateness
  - Persistence of inappropriate medication/dosages?
  - Undertreatment?

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  - Reasons for changes? Temporary or chronic use?



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- Clarification: check appropriateness
  - Persistence of inappropriate medication/dosages?
  - Undertreatment?
- Reconciliation: document medication changes
  - Reasons for changes? Temporary or chronic use?
- Transmission: communicate updated medication list
  - Patient
  - Next healthcare provider



# Medicines reconciliation vs review

Medicines reconciliation	Medicines review
Overall: assumes that the pre-admission used medication is indicated	Overall: indications of the entire pharmacotherapy are assessed and evaluated
Focus: medication changes and discrepancies	Focus: complete pharmacotherapy
Includes medicines optimisation: evaluation of the medication list with "simple" criteria e.g. laxative + opioid, NSAID + protonpumpinhibitor	Includes extensive sources for the review, including all lab parameters, previous ADEs, STOPP START criteria, Beers criteria etc. Includes evaluation of the changes over time

# Medication reconciliation at admission

## Prescribed by hospital physician

Medication at admission
Acenocoumarol 1 mg
Furosemide 40 mg once a day
Spirolacton 25 mg once a day
Metoprolol 50 mg ER once a day
Perindopril 4 mg once a day
Temazepam 20 mg once a day

## Community pharmacy records/patient

Pre-admission used medication
✓
✓
✓
✓
✓
New

## Missing

Isosorbide-5-mononitrate 25 mg ER once a day
Isosorbide Dinitrate 5 mg if required

# Medication reconciliation at discharge

Prescribed by hospital physician

Medication at discharge
Furosemide 40 mg once a day
Spirolacton 25 mg once a day
Metoprolol 50 mg ER once a day
Perindopril 4 mg once a day
Temazepam 20 mg once a day
Isosorbide-5-mononitrate 25 mg ER once a day
Isosorbide Dinitrate 5 mg if required

Community pharmacy records/  
inhospital records/patient

Check of discharge medication
✓
✓, but hyperkalemia → stop
✓
✓, but kidney malfunction → 2 mg
Discussion with patient → stop
✓
✓

Missing

Acenocoumarol? → add
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# Results cardiology ward (n=171)

	% pat with an intervention	Explanation
Hospital admission	69.6	Mainly discrepancies with medication used before hospital admission (69%)
Hospital Discharge	90.6	Still discrepancies present (59.1%) Optimize pharmacotherapy (72.5%)
Discharge counselling	94.7	Medication needs differ (34.5%) Optimize medication use (86.5%)
Information transfer	92.4	Mainly inform on medication changes + reasons and follow-up actions (91.8%)

Minimally one intervention was registered for all patients

# Key messages

## Medication reconciliation

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- Use electronic records



# Patient info: essential in med rec

**Table 3.** Medication Reconciliation Interventions per Patient<sup>a</sup>

Type of Intervention	Without Pt. Counseling, per Pt. (% of pts.)	With Pt. Counseling, per Pt. (% of pts.)	Difference Between Groups (95% CI)	p Value <sup>b</sup>
Prescription-related: correction discrepancy	1.34 (63.7)	1.88 (72.5)	0.54 (0.43 to 0.65)	0.000
start	0.36 (25.2)	0.68 (42.0)	0.32 (0.24 to 0.40)	0.000
dosage and schemes	0.60 (43.1)	0.81 (51.1)	0.21 (0.14 to 0.26)	0.000
switch	0.37 (27.9)	0.38 (29.0)	0.01 (0.00 to 0.03)	0.045
stop	0.02 (1.5)	0.02 (1.5)		
Prescription-related: optimization therapy	1.31 (67.2)	1.78 (76.3)	0.47 (0.37 to 0.58)	0.000
start	0.04 (4.2)	0.08 (8.0)	0.04 (0.01 to 0.06)	0.001
dosage and schemes	0.54 (40.1)	0.55 (40.1)	0.01 (-0.003 to 0.18)	0.158
switch	0.13 (11.5)	0.21 (18.3)	0.08 (0.04 to 0.12)	0.000
stop	0.60 (41.6)	0.95 (55.0)	0.35 (0.26 to 0.43)	0.000
Pt. medication handling-related: improve medication use by the pt.	0.02 (1.5)	1.62 (69.8)	1.60 (1.40 to 1.81)	0.000
recommendation	0.02 (1.5)	0.57 (40.5)	0.55 (0.46 to 0.65)	0.000
explanation		0.60 (38.2)		
medication supply		0.45 (22.9)		
TOTAL	2.66 (87.0)	5.28 (97.3)	2.62 (2.33 to 2.91)	0.000

<sup>a</sup>N = 262 patients.  
<sup>b</sup>Calculated by using the paired *t*test.

- Karapinar F, et al. Effect of medication reconciliation with and without patient counseling on the number of pharmaceutical interventions among patients discharged from the hospital. *Ann Pharmacother* 2009;43:1001-10

# Continuity: patient perspective

## Informational need

What the medicine is for

Whether the medicine has any side effects

Whether there are any interactions

What the medicine does and how it works

Whether the medicine is reimbursed

How to use the medicine

Duration of use

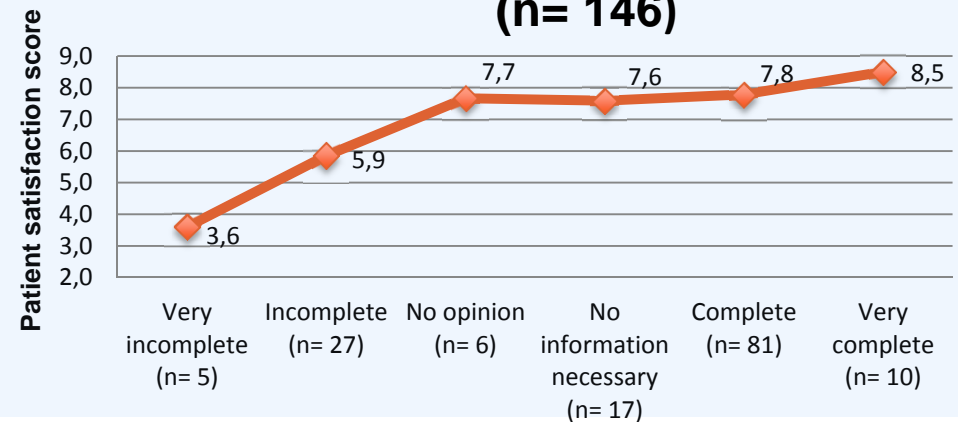
How long does it takes before the medicine works

Whether the medicine can make you feel drowsy

Only constant factor in the healthcare system

Empower patients in their own care

## Completeness of counseling versus patient satisfaction (n= 146)



# Medication information for the patient (front side, folded to A5)

## Side effects

All medications can cause side effects such as nausea or stomach disturbances. These side effects can be temporarily (as your body gets used to the medication). However, when some side effects occur it is important to contact your doctor as soon as possible. Here we give some examples:

- vomiting of blood
- bloody or black tarry stool
- persistent vomiting
- persistent diarrhoea
- muscle weakness and tingling
- swollen ankles
- increasing shortness of breath or shortness of breath when you lie down

Read the patient information leaflet for extra information. If you have any questions, ask your doctor or pharmacist.

Sint  
**Lucas**  **Andreas**  
Ziekenhuis

 better  safer  nicer

## MEDICATION SUMMARY

Hospital Pharmacy  
Jan Tooropstreet 164  
1061 AE Amsterdam  
Tel. 020-5108589

**PLEASE NOTE: the information on this summary expires when your medication is changed.**

## You as a partner in your healthcare

Health care personnel, such as doctors and pharmacist, try to help you with your medication use. But you also have an important role in your own healthcare. Here are some tips:

### 1. Keep up with your medications

- Make sure you always carry an actual and complete medication list with you. You can request a medication list from your pharmacist.
- Note on this medication list all medications you use including the medication which you may have bought without a doctor's recipe (e.g. herbals, vitamins, painkillers).

### 2. Share important information with your healthcare providers

- Show your complete medication list each time you visit a doctor.
- Tell your doctor and pharmacists which allergies or serious side effects you have endured and whether you have a decreased kidney and/or liver function.

### 3. Know the facts about your medication such as

- Why, when and how long you should use the medication.
- Whether tablets or capsules may be crushed/opened..

### 4. Never use someone else's medication and never share your medication with others.

### 5. Do not change your medication without consultation

- Do not change a dose or do not discontinue medication without consulting your healthcare provider. Even if you have no complaints, it is still important to use this medication. Some medication prevents healthcare problems.
- Consult your doctor or pharmacist first before you buy medication without a doctor's recipe. They can check whether this medication can be combined with the medication you already are using.



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# Medication list for patient (reverse side)

## Medication summary per: 13 march 2009

Patient: Mr. Example, O. 16-10-1923  
 Patientid: 04585632  
 Admission date: 02-03-09

ALLERGY: PENICILLIN  
 CONTRA-INDICATION: DECREASED KIDNEY FUNCTION

Specialist: Dr. Internal  
 Specialism: Internal medicine  
 Ward: A6

Start until	Stop	Medication name (brand name)	Medication used for	Dose	Administration scheme			
					Morning	Noon	Evening	Night
02-03-09		Acenocoumarol 1 mg tablet (Sintrom)	Blood thinning	Use according to blood tests Swallow your tablets whole with a drink of water	Use according to dosage scheme of anticoagulation clinic			
02-03-09		Furosemide 40 mg tablet (Lasix)	Water retention (oedema)	One tablet daily	1			
02-03-09		Metoprolol 50 mg SR tablet (Lopresor SR)	Cardiac illness	One tablet daily Swallow your tablets whole, do not chew	1			
02-03-09		Perindopril 2 mg tablet (Coversyl)	Cardiac illness	One tablet daily <b>Dose decreased due to decreased kidney function (date 12/3: 35 ml/min)</b>				
03-03-09		Isosorbide-5-mononitrate 25 mg capsule ER (Monocedocard)	Angina (chest pain)	One tablet daily Swallow your capsule whole, do not chew				
03-03-09		Isosorbide Dinitrate 5 mg tablet (Isordil)	Angina (chest pain)	One tablet daily Let tablet dissolve under you tongue				
02-03-09	12-03-09	Temazepam 20 mg tablet (-)	Trouble sleeping	One tablets daily <b>Discontinued, no indication</b>				
02-03-09	12-03-09	Spirolactone 25 mg tablet (Aldactone)	Water retention (oedema)	One tablet daily <b>Discontinued due to increased potassium (date 12/3: 5.2 mmol/l)</b>				

# Discharge counseling: recall

**Table 4.** Recall of in-hospital medication changes\* one week post-discharge

<b>Patients</b>	<b>Correct recall, n (%)</b>
With a medication change (n=88)	37 (42)
Without a medication change (n=16)	14 (88)
All patients (n=104)	51 (49)
<b>Type of medication change</b>	<b>Correct recall, n (%)</b>
New (n=162)	130 (80)
Dose-/frequency change (n=45)	23 (51)
Switch (n=35)	14 (40)
Stop (n=53)	20 (38)
All changes (n=295)	187 (63)

\* Includes only medication intended for chronic use



# Continuity?

- 54-82% does not know that medication was changed [1]
- 55% of patients uses the medication not as prescribed at discharge [2]
- Misinterpretation:
  - Baby dies due to bleeding in the brain (coagulation time too long)
  - The mother administered the vitamin K drops to herself
- Use teach back: check
  - ↑ knowledge, ↑ adherence [3]



[1] Ziaieian B, et al. J Gen Intern Med. 2012;27(11):1513-1520.

[2] Pasina L, et al. Drugs Aging. 2014;31(4):283-9.

[3] Negarandeh R, et al. Prim Care Diabetes. 2013;7(2):111-8.

# Key messages

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# Transitional care

- Beyond hospital walls:
  - ADEs for 19% of patients (<14 days after discharge)
  - 1,7 DRPs despite med.rec. at hospital discharge
    - Generally due to newly prescribed drugs

→ Collaboration needed with  
primary care



# Overview for next healthcare provider



Medication overview and discharge prescriptions per: 13 march 2009

Hospital Pharmacy  
Jan Tooropstreet 164  
1061 AE Amsterdam  
Tel. 020-6121700  
Fax. 020-4126211

Patient: Mr. Example, O. 16-10-1923  
Patientnumber: 12345678  
Admission date: 02-03-09

Specialist: Dr. Internal  
Specialism: Internal medicine  
Ward: A6

ALLERGY: PENICILLIN  
CONTRA-INDICATION: DECREASED KIDNEY FUNCTION

Start until	Stop	Medication name	Dose	Remarks	Number to deliver*	Administer route
02-03-09		Acenocoumarol 1 mg tablet	Use according to blood tests		<input type="text"/>	Oral
02-03-09		Furosemide 40 mg tablet	One tablet daily		<input type="text"/>	Oral
02-03-09		Metoprolol 50 mg ER tablet	One tablet daily		<input type="text"/>	Oral
02-03-09		Perindopril 2 mg tablet	One tablet daily	Dose decreased due to decreased kidney function (date 12/3: 35 ml/min)	<input type="text"/>	Oral
02-03-09		Monocecard 25 mg ER capsule	One tablet daily		<input type="text"/>	Oral
02-03-09		Isordil 5 mg tablet	One tablet daily		<input type="text"/>	Oral
02-03-09	12-03-09	Temazepam 20 mg tablet	One tablet daily	Discontinued, no indication	<input type="text"/>	Oral
02-03-09	12-03-09	Spirolactone 25 mg tablet	One tablet daily	Discontinued due to increased potassium (date 12/3: 5.2 mmol/l)	<input type="text"/>	Oral

Name hospital physician : .....  
Signature : .....

Community pharmacy : .....  
Fax : .....  
Please deliver medication : Yes / No , date .....

Deliver pill box : Yes / No  
The patient has received an administration scheme  
This information is also sent to the general practitioner  
Please inform anticoagulation clinic

**Backsubstitutions have been performed in hospital (unless intentional medication change)  
Community pharmacy please consider above medication as discharge prescriptions**

\* If number = 0, do not deliver medication, patient has a stock



# Continuity post-discharge



- Despite medicines reconciliation
  - Discharge letter completeness: 63% (e.g. changed drugs, allergies absent)
  - GP files: 16% (files were not updated)
  - Community pharmacy
    - Medication changes: 50%
    - Allergies: 51%

# Increasing implementation

- Med.rec. is time consuming
  - Are there enough pharmacists to serve everyone?
  - Pharmacy technicians/  
consultants/nurses/physicians etc



# Key messages



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# Use of IT



- A must, but IT is an AID
- Integrated electronic health records
  - no decrease of ADEs
- Electronic medicines reconciliation
  - Document pre-admission medication
  - System compares it with currently prescribed medication

# Patient portals

- Upload medication history to an online portal
  - e.g. using community pharmacy records
- Patient logs in and verifies his own drugs
  - In general suitable for planned admission, clinic visits
  - 50% reduction in time needed
  - Increased detection of discrepancies and patient activation to discuss DRPs, ADEs
  - Could increase med.rec. implementation
  - For pharmacy: from collecting a list to evaluating the pharmacotherapy on the list

# Key messages



## Medication reconciliation

- Not just simply matching medication lists
- Patients/carer: the only constant factor
- There is no continuity in one setting or one person/profession: train and delegate
- Use electronic records but be critical

# Medicines reconciliation in the Netherlands



# Dutch Healthcare

- Generally one community pharmacy
  - Medication records relatively complete
  - Regional electronic records
- One general practitioner
  - Sends patients to hospital if necessary





# Dutch policy document



- <24 hours an updated medication overview for
  - Hospital physician at (unplanned) hospital admission
  - Next healthcare provider at hospital discharge
- Updated medication overview
  - Prescribed, used, administered medication (plus prescriber)
  - Reasons for changing/discontinuing medication
  - Allergies, contra-indication, ADEs
  - Etc.

# Developments



- Med.Rec. generally performed by pharmacy technicians
  - Pharmacists are regarded too expensive
  - Difficulty in implementation for all patients
    - Increased due to reimbursements
- Standardised medication overview
  - Standardise communication nationwide
  - Problems with implementation in IT systems

# Hospital admission and discharge

## *Admission*

Rubbish in = rubbish out

Easier

Planned admission

Surgery: check medication that should be discontinued

## *Discharge*

Check changes, last check

Medication still needed?

Correct substitutions due to hospital formulary

Inform patient and next healthcare provider



# Sint Lucas Andreas Hospital

- Five departments (in 8 years)
  - Surgery, cardiology, pulmonology, neurology, internal medicine → move towards ED department
  - Recently: outpatient clinics
- Hospital pharmacist/researcher
  - Development procedures/checklists
  - Agreements with wards
- Pharmacy technicians, pharmaceutical consultant
  - Perform medication reconciliation
- Hospital physician
  - Act on information provided

# Pharmaceutical consultant

- Pharmacy technician with 3 years of additional training
  - Communication, drug related problems
- Capable of working independently
  - Supervision by pharmacists
- Compared to pharmacists
  - Less use of medical terms
  - Recognise drug forms, colours etc.



# Hospital admission and discharge

- Make medication overview using
  - Community pharmacy and inhospital records
  - Patient/family information
    - (containers, general practitioner)
- Check
  - Discrepancies: intentional?
  - Treatment according to guidelines?
  - Allergies/contra-indications documented?
  - Reason for medication changes?
  - Patient counselling and inform next healthcare provider



# Time per patient

	Time (min)
Medication reconciliation at admission	15
Medication reconciliation at discharge	20
Discharge counseling	23 (5-45)
Inform next healthcare provider	2



- Literature: 30 min to 2 hours/patient

- Bayley BK, et al. Evaluation of patient care interventions ...by a transitional care pharmacist. Ther Clin Risk Manag 2007;3:695-703.  
- Jack BW, et al. A reengineered hospital discharge program to decrease rehospitalization. Ann Intern Med 2009, 150:178-87.

# Return investment

- Approximately 60 min per patient
  - Associated labour costs: € 41 / patient
  - Medication costs savings < 6 months: € 97 /pat
    - Substitute medication to cheaper alternative
    - Discontinue medication (55% of patients overtreatment)
  - Benefit: € 56 /patient  
(€37 - €71)





# Evaluation

## *Internal medicine*

Regular care (n=341)

- Physician-nurse
- No med. rec. structurally
- No structured patient counseling
- Incomplete transfer at discharge

COACH (n=365)

- Pharmaceutical consultants
- Med. rec. on admission/discharge
- Discharge counseling
- Information transfer  
GP/community pharmacy

Patients were sign. more ill

Before: usual care

April 2009 - Nov 2009

Implementation

Dec 2009 - March 2010

After: COACH program

March 2010 - Dec 2010

# COACH program: effects



- DRPs(n=365)
  - 89%: discrepancies with medication used at home
  - 80%: optimisation of pharmacotherapy
  - 10 interventions per patient
    - 6/pat: medication change
    - 4/pat: optimise medication use by patient
- Patient satisfaction
  - 69% usual care vs 87% COACH: significant
- Unplanned readmission
  - 27% usual care vs 33% COACH: no sign. difference

# COACH program: effects

Table 3: Characteristics of all drug-related hospital re-visits

	<u>Before period</u> (n=34)	<u>After period</u> (N=44)
Preventability		
No	20 (58.8%)	28 (63.6%)
Side effect	17 (50.0%)	27 (61.3%)
Worsening condition	3 (8.8%)	1 (2.3%)
Yes, potentially with	14 (41.2%)	14 (31.8%)
Medication reconciliation*	4 (11.8%)	1 (2.3%)
Medication review†	4 (11.8%)	7 (15.9%)
Adherence focus‡	5 (14.7%)	4 (9.1%)
Unclear category§	1 (2.9%)	2 (4.5%)
No conclusion possible	-	2 (4.5%)
Readmission potentially preventable with COACH program	10 (29.4%)	7 (15.9%)
Readmission related to index hospitalisation¶	11 (32.4%)	16 (36.4%)
Readmission caused by a medication change initiated after the index hospitalisation**	6 (17.6%)	13 (29.5%)

# COACH program: costs



- Cost-effectiveness
  - Costs for society vs unplanned readmission
  - COACH: €6845/pat vs control: €7952/pat
  - Savings: €1160/pat (95% BI: -3168 - 847)
  - Patient diary (low response)
- From a societal perspective: no cost-effectiveness shown

# Conclusions

- Medicines reconciliation
  - Improve continuity of pharmaceutical care
  - Not without the patient
  - Includes medicines optimisation
  - To increase implementation IT is needed (aid!)
- Cooperation needed across the care continuum
  - Beyond our hospital walls



So...

We are not there yet



But this is what we  
want...

Time to challenge  
ourselves



# Acknowledgements

- Pharmaceutical consultants
- Pharmacy technicians
- Wards and patients
  
- Healthcare insurer Achmea
- (Hospital)pharmacists
  - P.M.L.A. van den Bemt
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  - A.C.G. Egberts
  - M.J.A. Janssen
  - J. Zoer

