

**Improved safety in the patient medication process
during hospital stay.
Experiences and outcomes from the LIMM-model
(Lund Integrated Medicines Management)**

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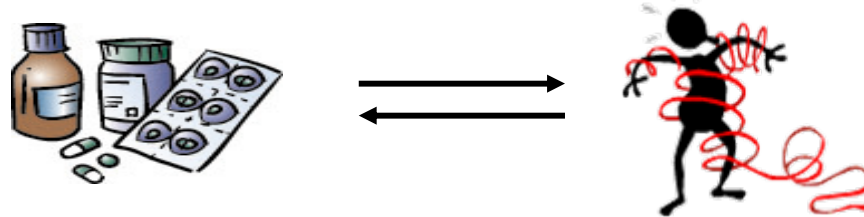


Researchers and partners

**Peter Höglund, Lydia Holmdahl
Patrik Midlöv, Åsa Bondesson, Anna Bergkvist-
Christiansen, Lina Hellström,
Ulf Persson, Ola Ghatnekar**



Benefit, problem and need for medications



- Medications are very good products, proven under controlled situations among specific patient groups

Data från The National Swedish Medication Strategy 2010

- 6-16 % av hospital admissions are medication related
- The yearly costs for avoidable drug related injuries is estimated at 0.6-2.6 Billion €

The LIMM-model:

- Decreases the absolute risk by at least 6.4%
- Reduces the costs by at least 0.4 Billion €/y

- We need a systematic practice model for improving patient safety and cost-effectivity.



Aim and objectives

Develop and research a systematic model for improved medication use during a patient hospital stay.

- Analyse problems and limitations in the standard patient medication care process
- Develop a structured team-based model incl. clinical pharmacy service
- Study the process and outcomes (clinical, humanistic, and economic)



Methods

- Design:
 - Descriptive studies to investigate problems
 - Comparative controlled studies to investigate improvements
 - Blinded evaluators for errors, consequences and clinical significance
 - Study size based on power calculations
- Analyses:
 - Descriptive and comparative statistics
 - Trend, regression and survival analysis
 - ITT and PP analysis
 - Probabilistic decision tree model



Hospital Care, a supportive process

How to identify, solve and prevent drug related problems in the hospital process and further?



Hospital Care, a (non-) supportive process

Low quality in documentation and communication



•2 errors in

•New drugs without

•2 errors in medication list

The L IMM-model solves all problems at almost 100%



The LIMM-model



A systematic approach to individualise and optimise drug treatment



The LIMM-model:

Activities, responsibilities and tools



When and how often	Activity and responsibility	Tool (instructions for each)
<p>At admission</p> <p>Once for each patient</p>	<p>Admission Medication Reconciliation by a clinical pharmacist</p>	<p>LIMM Medication Interview questionnaire, part 1-3 depending on patient, disease, and medication characteristics.</p> <p>Part 1 is focused on a correct patient medication list Part 2 adds questions on the patient's problems with practical handling, knowledge and adherence Part 3 adds questions for a deepened assessment of adherence and beliefs.</p>
<p>During hospital stay</p> <p>Continuously for each patient</p>	<p>Medication Review and monitoring by a clinical pharmacist</p> <p>Symptom assessment by nurse or clinical pharmacist</p> <p>Organize a treatment plan based on above activities by a physician</p>	<p>LIMM Medication Review form</p> <p>LIMM Symptom Scoring form</p> <p>Documented in the patient chart</p>
<p>At discharge</p> <p>Once for each patient</p>	<p>Discharge Medication Reconciliation by a physician</p> <p>Quality control of Discharge Medication Reconciliation by a clinical pharmacist at regular intervals</p>	<p>LIMM Discharge Information form, including a Medication Report and a Medication Summary</p> <p>LIMM Quality Control form for Discharge Medication Reconciliation</p>



Example of tools

LIMM Medication Interview (admission)

- Part 1 is focused on a correct patient medication list
- Part 2 adds questions on the patient problems with practical handling, knowledge and adherence
- Part 3 adds questions for a deepened assessment of adherence and beliefs

LMM Bilaga 5
 AL

APOTEKET
 FARMLAGI
 Region Syd Ömråde Mitt

Läkemedelsintervju- slutenvård

Ävd	Stug	Navn	Födelseår	Utförd (datum, tidpunkt)	Uppföljning (dat sign)
-----	------	------	-----------	--------------------------	------------------------

Aktuell läkemedelslista (enligt journal)						Korrekt lm lista				Sätter lm själv			
Patient skriver lm själv? <input type="radio"/> Ja <input type="radio"/> Nej			Apotek? <input type="radio"/> Nej <input type="radio"/> Ja, version			Describing*				Om problem (X) / Ej problem (-)			
Dat	Läkemedel, beredningsform, styrka	Dosering	Kommentar	Dat	UT			Korrekt	Ind	Följs	UF		

* Info från patient/ansökningsblankett (PA), vårdcentral (VC), kommun (K), Apotek (A), e-dos (E-D), läkemedelsförteckningen (LMP). Ange även datum för senaste uttag (LMP).

Övrig info från anamnes

	Lm lista, antal fel: _____

Tar du några andra läkemedel? ögondroppar kring inhaledtionsläkemedel smärtor hjärta mage
 öron diabetes receptivt läkemedel naturläkemedel vid behov. Hur ofta tar du dem? (regal/bunden osv)

Hanteringsproblem? Svårja; krossa/dela Få ut lm ur förpackningen Inhalera

Samtycke uttag från LMF:
 Datum _____ Sign _____

Version 2008-12-17


Dokumentansvarig: A Bondesson, Sjukhusapoteket, USIL

Example of tools

LIMM Discharge Information

- Written for the patient and includes;
 - Short presentation of causes for admission, what has been done and planned
 - Medication Report of all medication changes and the reasons for it (what and why)
 - Medication List with information on drug, dosing, effects and special remarks;
- Given to the patient at discharge
- Sent to the GP and the community care nurses on the day of discharge
- Developed by experts and patients

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Test Testsson
Testgatan 11
21748 Teststad

Discharge information

Discharge physician: Jan Oscarsson
Responsible physician: Lydia Holmdahl
Family doctor: Sven Svensson, VC Mosseby
Admitted: 2009-03-08 – 03-14

About your disease
You have been admitted to hospital due to fever and shortness of breath and treated at ward nr 8. X-ray of the lungs showed pneumonia. Fluid in the lungs is a sign of worsening heart failure. You have been treated with antibiotics and diuretics during the hospital stay.

Plans and follow up
You will be admitted to the nursing home at for expanded care-planning. Your Family doctor will contact you within 4-5 weeks for control of your heart and lungs.

Medication Report

- Furosemide has been increased from 1 to 2 tablets due to increased heart failure
- Spironolakton has been added due to low potassium levels and heart failure.
- Doxycycline (antibiotics) added for another week
- Importal substitutes Lactulose due to nausea
- Tramadol has been deleted due to nausea and no further need
- Digoxin dose has been decreased from 0.25 mg to 0.13 mg, blood level was to high.

Medication	Effect	Morning	Lunch	Evening	Night	Comment
Tabl Furosemide 40mg	diuretics	1	1			
Tabl Spironolakton 25mg	diuretics, potassium sparing	1				
Tabl digoxin 0.13mg	for the heart	1				
Tabl Stilnoct 5mg	for sleeping				1	As needed
Tabl Doxycycline 100mg	antibiotics	1				To Mars 16
Dose powder Importal	against constipation	1				
Tabl Paracetamol 500mg	against pain	1	1	1		

Results

Improvements from the L IMM-model 1(2)

- Activities at admission and during stay decreased;
 - un-identified DRPs from 9 to 1 (Bondesson 2009b)
 - in-appropriate drugs by 50-60% (Hellström 2011)
 - hospital revisits by 50%
- Medication Report decreased;
 - errors in medication lists by 50% (Midlöv 2008a)
 - need for medical care due to medication errors by 50% (Midlöv 2008b)



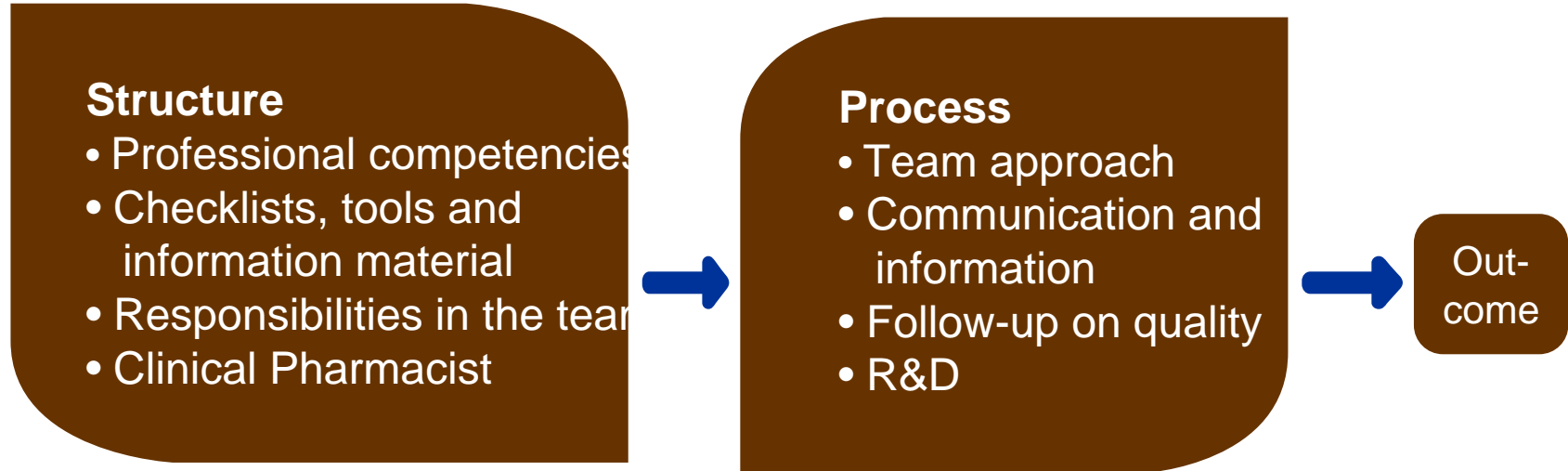
Results

Improvements from the LImm-model 2(2)

- For each hour spent by a pharmacist physicians and nurses saved; (Eriksson submitted)
 - 1½-2 h at hospital
 - ½-1 h in primary care
- The total model generate savings of €390 and gained utility of 0.005 for each patient. The model is cost saving at a 98% chance (Ghatnekar report).
- Physicians/nurses very satisfied (process, pharmacist) (Bergkvist 2011, Bondesson 2008)



Quality assurance in the LIMM-model



Using the same structure and process (and prove it) the LIMM-model can be implemented in similar settings and the outcomes guaranteed



Acceptance

- 4 national quality and research awards
 - Best innovation in Swedish health care in 2009 (The Gold scalpel)
- LIMM-Discharge Information mandatory at hospitals in Skåne County
 - Suggestion for Swedish law changes
- The total LIMM-model
 - at 20 wards in Skåne
 - starting i Mid-Norway
 - Decision in Skåne to employ 40 clinical pharmacist
- MSc Pharmacy programs at Lund University focusing on LIMM



Conclusion

- The L IMM-model including Clinical Pharmacy Services
 - avoids medication errors
 - improves the process of care
 - Improves important clinical, humanistic and economic outcomesby identifying, resolving and preventing drug related problems.
- Documented based on 18 scientific publications, four PhD- and more than 30 MSc-thesis
- Large impact on health care in Skåne, and is spreading



Thanks

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National Swedish plans for improved patient safety

LIMM-model and -researchers have high impact

Prevent medication errors in care transitions



Prevent drug related problems

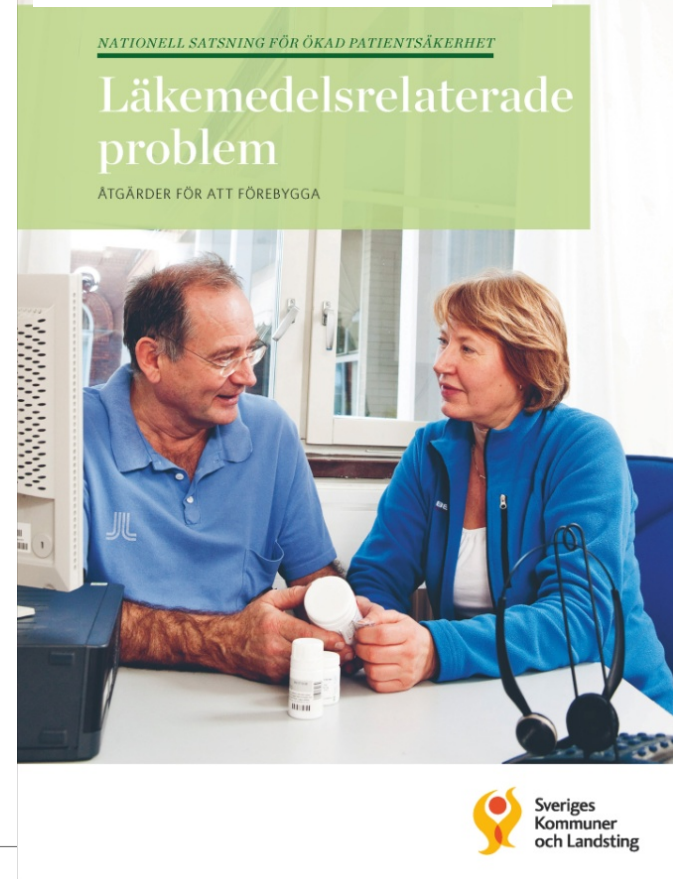


Figure 1. Cost-Effectiveness Acceptability Curve for the L IMM-model (total)

