

Efficiency improvement by
Extension of Core lab automation in
a
midsize University Hospital

*Malmö University Hospital
Dept of Clinical Chemistry*

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Head of Core Lab*



County Council Skåne
1.1 million inhabitants



Customers we serve

- **Catchment Area**
 - **Local Population:** 350,000
 - **Regional Population (Skåne)** 1.1 Million
- **Two Hospitals**
 - **Malmö University Hospital** 850 Beds
 - **Trelleborg** 200 Beds
- **Extensive Outreach Activity**
 - **GPs**
 - **9 % external samples (Sweden, Denmark, industry)**



If you don't plan you plan to fail!

Plan and prepare for Automation:

- Work Flow Analysis
- Correct preanalytics
- Test Request system (paper, electronic)
- Standardize barcodes (Unique barcode on every tube)
- Standardize specimen (one size, plastic gel tube)
- Transport logistics (avoid peak hour)



Boarder before you take off!

- Have the right expectations
- Involve your staff in planning
- IT, IT, IT
- You have to stay with your chosen vendor

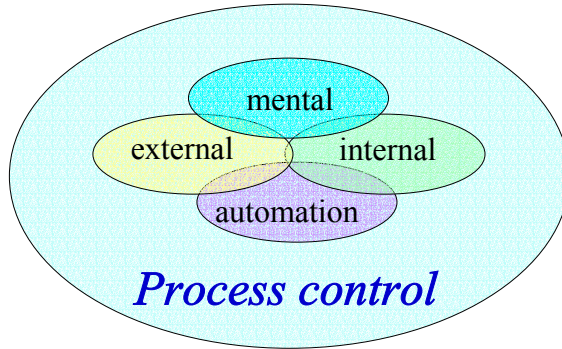


Before automation, consolidation

- Floor planning
- STAT and routine testing on the same platform
- Avoid automating bad processes
- Simplify routines (Automation can't compete with flexibility of man)



Total laboratory automation
-Single vial automation



Steps to take

Pre Analytical Process Control

Consolidation

Automation

Post Analytical Process Control



Our workload

- 1,800 request forms per day
 - 20% STAT
 - Test requests on marksense forms
- 4 000 – 5 000 samples per day
 - 2 500 on automation system
 - 1 000 hematology
 - 500 coagulation
- 5 % annual increase



Optical Mark Readable request, OMR

Remiss, rutin- / akutanalyser

SKÅNE
Klinisk kemi
Universitetssjukhuset MAS
205 02 MALMÖ
Tel 040 33 11 22
Fax 040 33 10 88

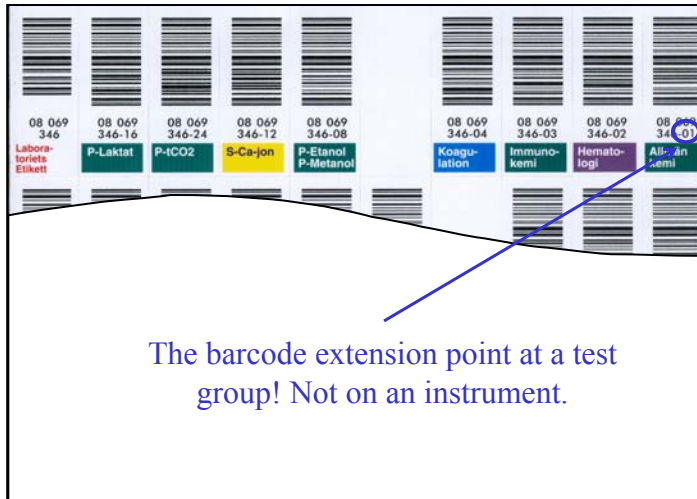
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Remissen får ej vikas

Unique Request Number



Internal process control Unique Specimen Number



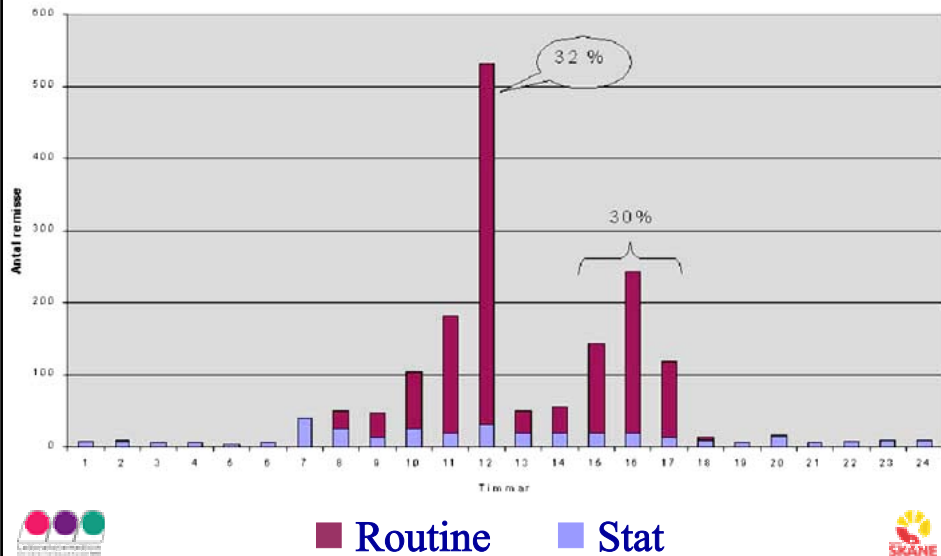
External process control Problem Specimens

Total Audited Tube Volume	5 278
Inadequate volume	55
Tube less than 50% filled	29
Fibrin clot	100
Badly spun (Gel problems)	235
Gel broken down by heat	106
Badly labelled tubes	200
Total	725
% Total	13,7%

Need for preanalytical quality improvement!



Workload: Reception of request forms



■ Routine ■ Stat



The Wards Rinse compartment

*Previous
specimen
collection*



Present specimen collection



Locker in the Basement

Present logistic of specimen collection

- from 97 to 11 client pick-up sites
 - 6 pick-up tours
- | | | |
|-------|-------|-------|
| 09:00 | 10:00 | 11:30 |
| 13:00 | 14:15 | 16:00 |



Steps to take

Pre Analytical Process Control

Consolidation

Automation

Post Analytical Process Control



Platform Consolidation: Routine & STAT testing

DAX 48

CX 7

Access

Access

Immuno 1

DAX 48

CX 7

Access

Access

Immuno 1

4 LX 20 + 2 Dxi 800



Steps to take

Pre Analytical Process Control

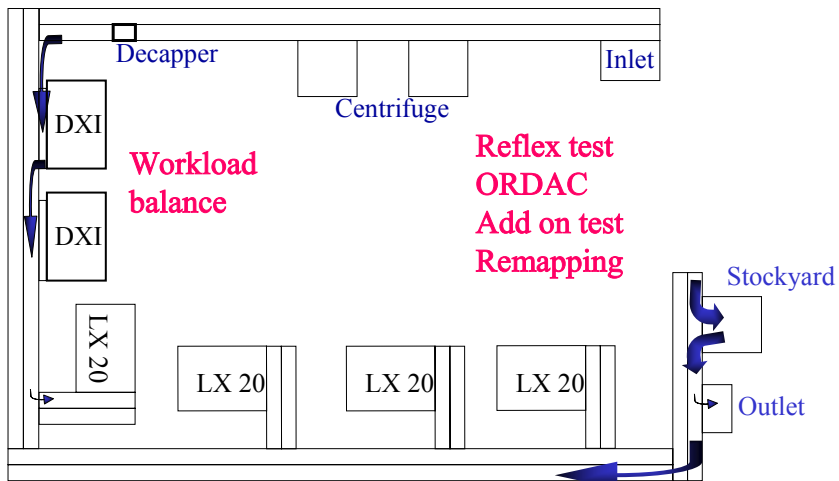
Consolidation

Automation

Post Analytical Process Control



Single tube driven process *Flexibility!*



IT process control - a system with several levels

LIS

Laboratory **I**nformation **S**ystem
(Download requests, add on test,
Dilutions, reflex testing mapping and validation)

Remisol

Laboratory **A**utomation **S**ystem
(Download requests, add on test,
dilutions reflex testing and validation)

Pre-
Link

Routing Organizer

Line-
comp.

Line Controller



Steps to take

Pre Analytical Process Control

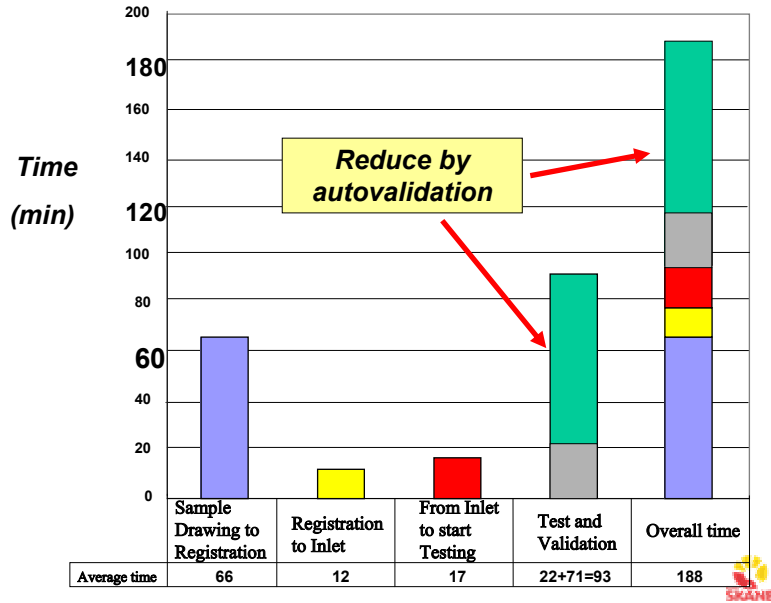
Consolidation

Automation

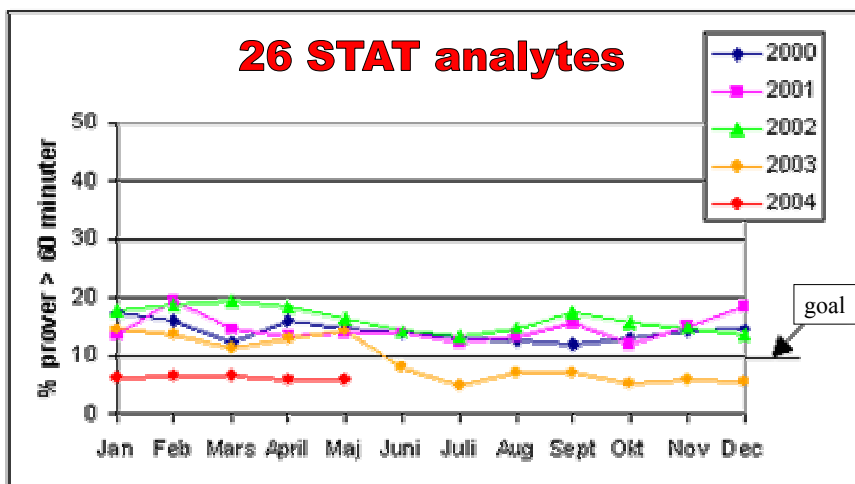
Post Analytical Process Control



Hospital routine samples Total turn around time



Turn around time All STAT samples



Electronic reporting

Electronic Reporting 65%

- To Hospital Information Systems
- Primary Health Care Information Systems

Alternative Reporting 35%

Fax, Printers, mail and phone



So what have we learned from practical work using our automation?



Have the right expectations!

Process control starts at the very beginning!!

- **Standardize !**
- **Simplify !**
- **Eliminate preanalytical errors !**

Automation is a preanalytical challenge!



Practical experiences

- **New competence**
 - **Present staff**
 - **New staff**
 - **Diagnostic industry**



Practical experiences

- ***Rebuilding necessary***
 - ***Expensive***
 - ***Time for planning ...***
 - ***Time consuming***



Practical experiences

Capacity

- Increased total capacity
 - Continuous flow to instruments
- Operates as one analyser
 - One inlet for most samples
 - No specified STAT analyser
 - No need for manual STAT routines
 - Common validation for all instruments



Practical experiences

- ***Process engineering – not sample testing***
- ***Robust!***
- ***Single vial automation***
 - ***Flexibility and throughput***
- ***Sample quality supervision***
 - ***Hemoglobin, bilirubin, fibrin clots***
- ***Possibility to work manually***



Practical experiences

General experiences from the lab floor

- *Nobody wants to go manual*
- *You don't see the sample*
- *More even work flow*
- *Better validation*
- *More instruments - more noise*
- *Need for more competence on system, electronics, pneumatics*



Managing implementation of automation

- Strong commitment over long time
- Management support
- Project leadership
 - Communications
 - many players, many changes
- Project group(s)
- Activity leaders



The effects of automation & Improved Efficiency



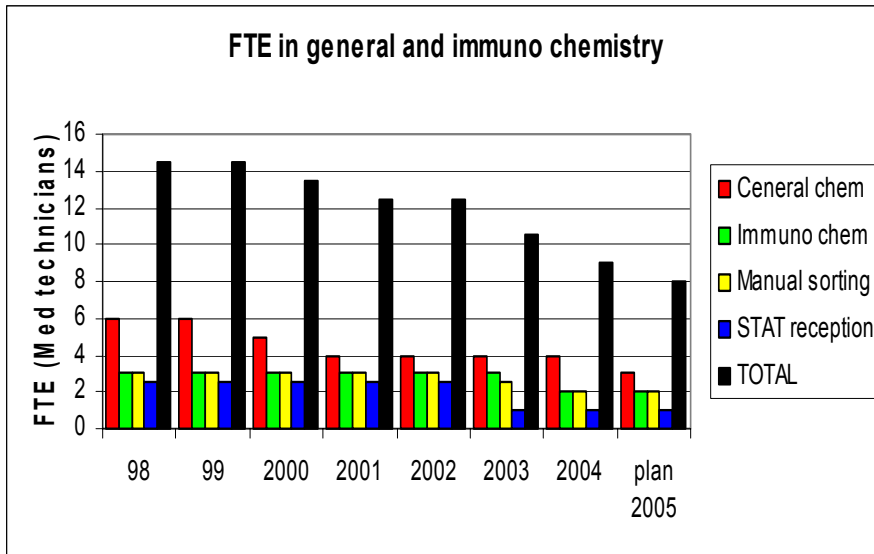
Consolidation effects

Fewer instruments AND one deliverer reduces cost for:

- Investments
- Reagents
- Service
- Personal: Training, staffing

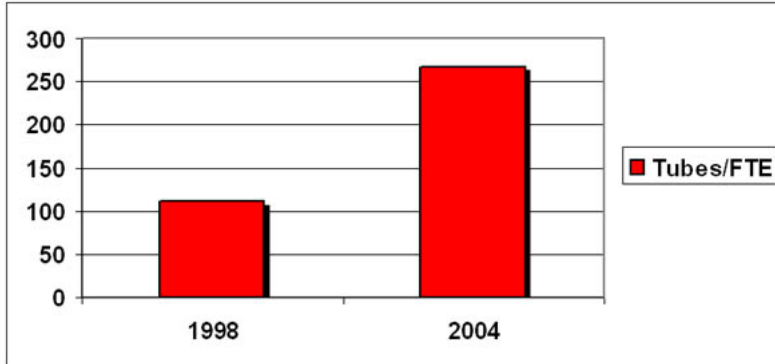


Effect of consolidation, automation and autovalidation on staffing at work stations

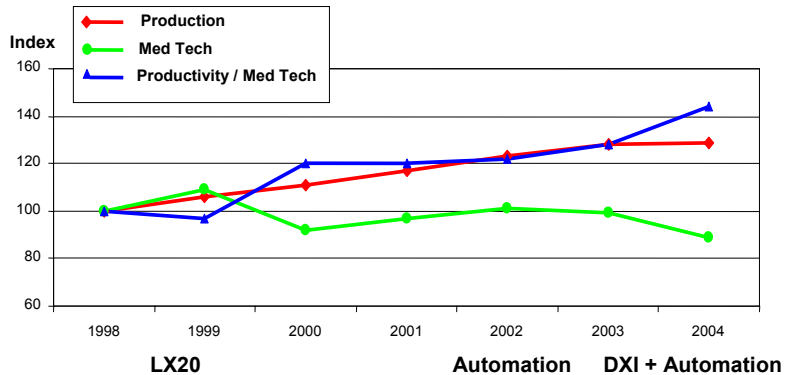


Efficiency General- and immunochemistry

- A technician handles 150 % more tubes today



Entire Corelab; 44% Efficiency Improvement



Automation has fulfilled established goals!

- Reduce non-productive labour YES
- Free manpower for value-adding work YES
- Reduce manual error No data
- Reduce turn around time
 - STAT YES
 - Routine YES
- Include special chemistry tests YES
- Reduce hazards from handling of samples YES

