Clinical Use of a Patient Data Management System

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Clinical Use of a PDMS

• General background: ICT in health care

• Using the PDMS in my daily practice

• Lessons learnt and wish list
The 180°- Shift (from disease- to patient-centred care)

Traditionell
Denken und Handeln in Funktionen
(Pflege, Ärzte, Physiotherapie, Administration, …)

Prozess-Basiert
Denken und Handeln in Prozessen
(Patient und sein Weg durch das Spital)

Etienne M. TQM-Leitfaden für Spitäler, 2005:49
The 180°- Shift is also true for ICT!

EMR (electronic medical record) = shared clinical information

local clinical information

local clinical information

local clinical information

ICU/IMC/HDC

CARE PROCESS CONTROL

increased demand for technology

Modified from J. Takala, Bern
From a data cloud to consistent delivery of care

Clinical Use of a PDMS

• General background: ICT in health care

• Using the PDMS in my daily practice
  – Patient management
  – Daily management of the ICU
  – Strategic management of the ICU

• Lessons learnt and wish list
PDMS in the ICU / Hans Ulrich Rothen
Computerized physician order entry: Pro

• Before-afier study
• Mixed adult ICU (tertiary academic center)
• Computerized decision support for red cell (RBC) transfusion in critically ill adults

Computerized physician order entry: Pro

- Reduction in the use of RBC
- Presumably a combined effect of
  - Education
  - Protocol
  - Decision support
  - CPOE (forcing functions)

Computerized physician order entry: Con

- Introduction of CPOE
- Tertiary care level children‘s hospital

Computerized physician order entry: Con

- Introduction of CPOE
- Tertiary care level children’s hospital

- Possible causes of increased mortality
  - Additional time to enter orders in CPOE
  - More time spent upfront (→ reduced time at bedside)
    - Physicians
    - Nurses
  - Delays in administration of critical medication
    - Due to centralisation of pharmacy services
  - General clinical application program suboptimal for ICU

- But
  - Association is not necessarily cause-and-effect relationship!

"Smart Alarm" → Relevant provider action

„Smart Alarm“ → Relevant provider action

**VILI Alerts**

- Decreased tidal volume: n=8, 12%
- Changed the mode of ventilation: n=9, 14%
- Increased sedation or neuromuscular blockade: n=17, 26%
- No intervention: n=17, 26%
- Other intervention: n=14, 22%
- False alerts: n=46, 32%

Clinical decisions-support systems: actual state

**Aim:** To evaluate the effect of CDSSs on clinical outcomes, health care processes, workload and efficiency, patient satisfaction, cost, and provider use and implementation.

**Conclusions**

- Both commercially and locally developed CDSSs are effective at improving health care process measures across diverse settings.
- However, evidence for clinical, economic, workload, and efficiency outcomes remains **sparse**

See also NIH’s HTA assessment 2010, 14:No 48
Daily management of the ICU
Strategic management of the ICU

• The central role of an ICU in the acute care hospital
• Planning structures and resources
• Orientation towards results (reporting)
• Quality control and management
  – Concentration on a few key elements
  – Taking advantage of strengths
  – Trust and positive thinking
Practice and perception—A nationwide survey of therapy habits in sepsis*

Frank M. Brunkhorst, MD; Christoph Engel, MD; Max Ragaller, MD; Tobias Welte, MD; Rolf Rossaint, MD; Herwig Gerlach, MD; Konstantin Mayer, MD; Stefan John, MD; Frank Stuber, MD; Norbert Weiler, MD; Michael Oppert, MD; Onnen Moerer, MD; Holger Bogatsch, MD; Konrad Reinhart, MD; Markus Loeffler, MD; Christiane Hartog, MD; for the German Sepsis Competence Network (SepNet)

Table 1. Recommended interventions (treatment goal)

<table>
<thead>
<tr>
<th>Time and severity independent</th>
<th>Perceived (%)</th>
<th>Adhered (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-tidal volume ventilation$^a$</td>
<td>90%</td>
<td>80%</td>
</tr>
<tr>
<td>(≤6 mL per kg predicted body weight)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glycemic control$^b$ (blood glucose 4.4–6.1 mmol/L)</td>
<td>80%</td>
<td>70%</td>
</tr>
</tbody>
</table>

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<tr>
<th>Time and severity dependent</th>
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<tbody>
<tr>
<td>Activated protein C$^c$</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td>Low-dose hydrocortisone (200–300 mg/24 hr)$^d$</td>
<td>60%</td>
<td>50%</td>
</tr>
<tr>
<td>Non-use of low-dose dopamine to protect renal function (≤ 5 µg/kg/min)$^e$</td>
<td>70%</td>
<td>60%</td>
</tr>
<tr>
<td>Non-use of antithrombin$^f$</td>
<td>80%</td>
<td>70%</td>
</tr>
</tbody>
</table>

The first score: Apgar Score

A Proposal for a New Method of Evaluation of the Newborn Infant.*

Virginia Apgar, M.D., New York, N. Y.
Department of Anesthesiology, Columbia University, College of Physicians and Surgeons and the Anesthesia Service, The Presbyterian Hospital

Resuscitation of Infants at birth has been the subject of many articles. Seldom have there been such imaginative ideas, such enthusiasms, and dislikes, and such unscientific observations and study about one clinical picture. There are outstanding exceptions to these statements, but the poor quality and lack of precise data of the majority of papers concerned with infant resuscitation are interesting.

Apgar V. Curr Res Anaesth Analg 1953, 32:260-7
What is a score (scoring system)?

- **Score and scoring system**
  - Rating, or disease classification system

  - Usually expressed numerically

- **Based on**
  - Predefined set of variables
  - Rating of each variable, using a predefined scale
Why do we use scores in the ICU today?

• Research
  – Inclusion/exclusion criteria in prospective studies
  – Risk stratification
  – Check for balance between groups (RCT)

• Quality management & benchmarking
  – Calculation of indicators (Severity of acute illness)
  – Risk adjustment, based on outcome prediction models (SMR)

• Reimbursement (SwissDRG)

• Protocols for patient care
  – Sepsis: Use of activated protein-C
  – Liver transplant (MELD: Model for end-stage liver disease)
  – Acute care hospital ward: Trigger for medical emergency teams
Customized eSimplified SAPS

UK: Intensive Care National Audit & Research Centre

Standardized mortality ratio (SMR) vs. Number of admissions

Case mix programme, summary statistics 2011: www.icnarc.org
Sweden: Svensk Intensivvårdregistret – SIRS

Variable Life Adjusted Display

Kumulativt Riskjusterat Resultat

R65.1 Svår Sepsis (1 932)
R57.2 Septisk chock (1 524)
J80.9 ARDS (365)
I46.9 Hjärtstopp (1 404)
K85.9 Pankreatit (367)
K92.2 G-I blödning (1 665)
J44.9 KOL (2 535)
J09.9 Influenza pandemikarätär (55)
T07.9 Multipla skador (1 405)
S06.9 Intrakraniell skada (1 212)
J60.9 Subarankniotalblödning (604)
I71.0 Ao-dissektion (300)
I71.8 Ao-aneurysm, brustet (286)
I71.9 Ao-aneurysm, ej brustet (504)
G00.9 Meningit bakt (211)

N 14 255

SAPS3

Hjärtstopp

Septisk chock

G-I blödning

Multipla skador

Svår sepsis

COPD

SIRS Arsrapport 2011: www.icuregswe.org
ICU processes and outcome: SAPS 3

Standardized mortality ratio (SMR) vs. Standardized resource use (SRU)

SwissDRG-Grouper

**MDC**

*major diagnostic category*

**IM Komplexbehandlung**

**Beatmung 24 - 96 – 250 h**

**Prä-MDC**

**Hauptdiagnose (ICD-10GM)**

**CHOP (Prozeduren)**

**Nebendiagnosen CCL (complication and/or comorbidity level)**

**DRG**
Clinical Use of a PDMS

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The ICT Productivity Paradox: Confirmed?

• There is a negative effect of ICT on health care
  – Increased costs without any gain in productivity
  – Safety Problems

• Lack of gain in productivity is due to
  – Mismeasurement
    • Output difficult to measure in service industry (accessibility, convenience, …)
  – Mismanagement
    • Overly optimistic expectations about return of investment
    • Impatience
  – Poor usability
    • Lack in focus on best ways to improve ICT use in health care
    • Functionallity in health care behind usage in „civilian“ life

PDMS: A wish list

To support clinical management of the patient

• Context-related and integrated display of clinically relevant data
  – Monitor, support systems, laboratory, drugs, …
  – Display of trends

• Support of clinical workflow
  – Computerized physician order entry (CPOE)
  – Handover
  – Clinical decision-support system

• Allow for valid (reliable, timely, tracking) documentation
PDMS: A wish list

To support management of the ICU

• Bedside documentation of relevant information
  – Therapeutic procedures
  – Drugs, …
  – Diagnoses
  – Administrative data

• Resource management

• Controlling and reports

Modular configuration

Support

• Configuration

• Training

• Continuous development and adaptation to new needs
Do not forget the main goal of an ICU!