Value Based steering and support systems for Danish health care

Feasibility study – Full version
Copenhagen May 2015
Content

• Background of feasibility study and case examples from Sweden

• Denmark starting point (organisational readiness and data landscape)

• High level assessment of potential for ten selected patient groups in Denmark

• Suggested roadmap for Denmark

• Appendix
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  - Starting point; Health care challenges and trends
  - Value based steering and support; case examples from Sweden
  - Objectives of this feasibility study
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Starting point: The Danish health cares system is performing relatively well according to the OECD

- **Life expectancy in line with OECD average** (DK: 80.1 y. / Ø: 80.2 y.)

- Relatively **low mortality rates from cardiovascular diseases** (Top quartile in OECD)

- Relatively **high mortality rates from cancer diseases** (Bottom quartile in OECD)

- Successful specialisation and productivity increase of hospitals

"Denmark is rightly seen as a pioneer in health care quality initiatives among OECD countries. Yet, like all other countries, it faces a number of challenges over the coming years”

Source: OECD Health Statistics 2014 - *How does Denmark compare?* (Data primarily from 2012)
**Challenges (1/3):** However, Denmark face overarching challenges similar to other western countries

### Overarching challenges (not exhaustive)

- Costs for Healthcare growing faster than GDP
- Unjustified variations in procedure methods, health outcomes and cost
- Slow diffusion of ‘best practices’

### Observations

<table>
<thead>
<tr>
<th>HC spend % of GDP</th>
<th>2000</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8,3%</td>
<td>10,6%</td>
</tr>
</tbody>
</table>

**Variation illustrative**

- Quality registries/IVBAR analysis confirms variations (in line with similar countries)

Source: OECD Health statistics 2014; Expert interviews
Challenges (2/3): Steering models focus on individual activities rather than complete treatment processes and optimisation of these

Typical challenges in OECD countries (not exhaustive)

- Steering focused on waiting times, productivity and cost of individual visits, rather than on patient relevant health outcomes and cost of entire treatments
- Insufficient coordination of treatment processes, especially when treatment includes several providers (e.g. hospitals and primary care) and several payers (e.g. regions and counties)
- Frustration among medical professionals and patients

Source: Expert interviews
Challenges (3/3): Healthcare goals not clearly defined making steering and support to providers very complicated

**Typical Goals (non-exhaustive)**

- Access to care /waiting times
- Quality
- Cost containment
- Better Integration
- Patient safety
- Patient satisfaction
- Etc.

- Lack of clarity?
- Conflicting goals?
- Difficult to unite around?
Addressing the overarching problem: The framework “Value Based Health Care” has been developed in response of today’s challenges defining the common goal of health care as “Value for the patient”

Patient relevant health outcomes, examples:
- Survival
- Quality of life
- Pain level and functional ability
- Depression
- Incontinence/impotence

$Value = \frac{\text{Health outcomes}}{\text{Resource usage/cost}}$

All costs associated with achieving those health outcomes (cost for provider, not reimbursement)

What is new with “value” as a goal?
- Combines all other goals
- Patient relevant focus - easy to unite around
- Calculates cost of treatment instead of cost of organizational unit
- Works at all levels (provider, region, municipality, state)
Strategic implications: To work “value based”, health care organization and steering need to be developed which requires new tools.

Necessary transition

From productivity

- Monitoring, target setting focused on waiting times, cost and productivity
- Reimbursement based on activities
- Healthcare organized around medical disciplines

To patient value

- Monitoring and target setting focused on waiting times, health outcomes and efficiency
- Reimbursement designed to support efficiency and innovation
- Healthcare organized around patients groups with similar needs

Examples of engaged organisations

Requires new steering tools

Governance/steering

Organization

Reimbursement based on activities

Reimbursement designed to support efficiency and innovation

Healthcare organized around patients groups with similar needs

Healthcare organized around medical disciplines

Strategic implications:

To work “value based”, health care organization and steering need to be developed which requires new tools.
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**Examples from Sweden, SVEUS:** Seven Swedish counties have been working together since 2013 to develop value based steering and support systems in SVEUS

### SVEUS

<table>
<thead>
<tr>
<th>När hälsan välkanas</th>
</tr>
</thead>
<tbody>
<tr>
<td>• &gt;50 organisations in Sweden working together in developing new monitoring and reimbursement models</td>
</tr>
<tr>
<td>• Represents ~70% of Swedish population</td>
</tr>
</tbody>
</table>

### Sveus content

1. **In depth benchmarking**
2. **New monitoring systems** focusing on efficiency
3. **New reimbursement systems** that support efficiency

### To support value based steering and support

#### Clinic

1. Enable monitoring of efficiency through new monitoring systems
2. Set focus areas and value improvement targets with clinics
3. Plan and perform improvement projects
4. Provide development support to clinics
5. Reporting of results and performance dialogues on value

#### Management

1. Enable monitoring of efficiency through new monitoring systems
2. Set focus areas and value improvement targets with clinics
3. Plan and perform improvement projects
4. Provide development support to clinics
5. Reporting of results and performance dialogues on value
6. Follow up on targets, set new targets with clinics
Examples from Sweden, SVEUS: Sveus is organised in 12 projects with a national steering group – combining regional autonomy with the advantages of national collaboration

Styrgroup – nationell samverkan
- Socialdepartementet
- Senior representant från respektive deltagande landsting och SKL
- Representant från Karolinska Institutet
- Representant från IVBAR

Programkontor

1- Expertgrupp Höft/knä (SLL)
3- Expertgrupp Förlossning (SLL)
5- Expertgrupp Stroke (Skåne)
7- Expertgrupp Osteoporos (Östergötland)

2- Expertgrupp Rygg (SLL)
4- Expertgrupp Fetmakirurgi (VGR)
6- Expertgrupp Diabetes (Jämtland, Dalarna)
8- Expertgrupp Bröstcancer (Uppsala)

Funktionella landstingsöverskridande expertgrupper

Juridik & Informations-säkerhet
Kommunikation
Vårdinformatik
Ersättningssystem

Lokala landstingsprojektgrupper
Examples from Sweden, SVEUS: What is unique with Sveus monitoring systems

1. Developed in broad collaboration of health care stakeholders
   - More than 50 organisations engaged including National Medical Specialist associations, quality registers, patient organisations, regions/counties, universities, Social Insurance Fund, Ministry of Health and Social affairs...

2. Monitoring system presents efficiency, including both patient relevant outcomes and cost of treatment
   - Focuses on those health outcomes that are most relevant to the patient
   - Includes as much as possible from the care process with data from many sources
   - Monitoring of performance of different patient groups presented in the same format

3. Designed to enable ‘intelligent’ benchmarking
   - Results adjusted based on treated patients characteristics (case-mix)
   - Standardised information model complying with international standards

4. Continuously updated data with online feedback to providers and regions
   - Gives continuously and easily accessible feedback to support continuous improvement and identification of deviations

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1) Requires established collaboration Between Danish Regions and Sveus counties/regions
Examples from Sweden, payment models: Implementation of bundle payment for THR/TKR in Stockholm county resulted in lower cost and reduced complications

**Context**

Before 2009 – THR & TKR
- Waiting up to two years for surgery
- No systematic quality control from county

2009 – Introduction of bundle payment
- Accreditation of providers and “patient free choice” of provider
- “Package price” for episode of care up to five years post surgery (Including “complication warranty”)

**Experienced benefits**

- Average cost per patient as well as total cost dropped
- In addition
  - ~20-40 % reduced complication risks
  - Providers changed how they worked (e.g., new manuals and checklists, certification of personnel)

**Before 2009 – THR & TKR**
- Waiting up to two years for surgery
- No systematic quality control from county

**2009 – Introduction of bundle payment**
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- Providers changed how they worked (e.g., new manuals and checklists, certification of personnel)

**Chart 1 – Cost per patient**
- SEK thousand
- Cost per patient
- Volume

**Chart 2 – Total cost**
- SEK million
- Volume

**Chart 3 – Volume**
- # of patients
- 0
- 2 K
- 4 K
- 6 K

Info on scope (so far):
- All providers
- ASA 1-2 patients
- SVEUS develops next generation of bundle payment for THR/TKR
Examples from Sweden, payment models: Spine surgery bundle payment introduced in Stockholm county during 2013

**Context**

- Bundle payment implemented in 2013 for Stockholm county
- Bundle includes
  - Case-mix adjustment
  - Complication warranty
  - “Bonus” associated with achieved pain reduction, as reported by patient
- Developed in collaboration between Stockholm county, Swedish Association of Spine Surgeons, and IVBAR

**Experienced /Expected benefits**

- Care providers take a more proactively and holistic responsibility for the patient journey, including rehabilitation
- Care providers have made investments in equipment and education for personnel in order to minimize complications
- Price reductions are expected to bring cost reductions (given same volume of patients are treated)

Info on scope (so far):
- Private providers
- All patients
SVEUS develops next generation of bundle payment for Spine
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Project objectives: Feasibility project was setup to assess DK starting point and evaluate opportunity to move towards value based steering and support models

**Project objectives**

1) **Assess starting point and general prerequisites for Denmark to adopt value-based steering and support models** (based on learnings from Sweden)

2) **Assess potential and ‘ease of implementation’** through deep-dives in selected patient groups (medical conditions)

3) **Support Danish Regions to develop a roadmap**
Content

• Background of feasibility study and case examples from Sweden

• **Denmark starting point (organisational readiness and data landscape)**

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Assessment of Denmark starting point has been based on qualitative and quantitative information

**Sources of analysis**

**Key stakeholder interviews**
- Interviews to understand general prerequisites to adopt value-based steering and support models

**Data landscape**
- Mapping of information need vs available data sources
- High level legal analysis
Key stakeholder interviews (1/3): ~40 key leaders and experts have been interviewed to evaluate DK starting point and future vision

*Interviewees include:*

- Regional representatives (primarily administrative leaders)
- Governmental institutions/ministries
- Danish Regions (key leaders and experts)
- Patient organisations
- Medical organisations
- Other key opinion leaders
Key stakeholder interviews (2/3): Current systems have helped Denmark to improve productivity, but need more focus on efficiency/quality moving forward

**What works well?**

- Macro indicators of overall effective health care delivery in DK compared to other countries
- Improved productivity through DRG-system
- Effective cost containment through new budget law and effective consequence management
- Improved access through national waiting time regulations
- Successful centralization of specialist care

'‘DRG has really helped us gain productivity’

‘our concentration to a few specialist institutions means that we can aggregate volumes and get really good on what we are doing’

**What could be improved?**

- Need to complement productivity focus with efficiency focus
- Increase focus on outcomes that are relevant for patients
- Improve the health care system’s access to/usage of data
- Improved collaboration between specialty care and primary care; Improved collaboration between regions and municipalities

‘‘We need to shift focus from productivity (activities and DRG-points) to efficiency’

‘After waiting times were reduced, the Danish health care system has not had a clear goal or direction’

‘We often don’t measure outcomes that matter to our patients’

‘No one has likely ever died from combining data, however many persons have likely died because we haven’t been able to connect the different data points’
Key stakeholder interviews (3/3): Overall positive momentum to complement current steering models, but changes need to happen at a controlled pace

**Positive momentum/ initiated initiatives**

- Several planned and ongoing initiatives with elements of patient value, e.g.,
  - ”Vaerdi for borgaren” - Sjaelland
  - ”Ny styring i ett patientperspektiv” - Midtjylland
  - Publication of results/benchmarking - Rigshospitalet

**Emerging perspective on way forward (synthesis)**

- **Focus first on improving monitoring of patient value (efficiency):** Initial focus should be to establish monitoring systems and performance dialogues focused on value

- **Limited (and “budget-neutral”) changes to reimbursement in first step**
  - Firstly secure that you remove hinders from current systems
  - Be careful with putting financial incentives to single KPIs
  - Maintain current budget control mechanisms

- **Establishment of proof-of-concept through pilots:**
  Development of new steering and support models should be done through pilots rather than big-bang changes
  - Focus initially on areas with high potential
  - Focus initially on ”easily implementable” patient groups (and potentially some more complicated with radically different pre-requisites)

**Evolutionary rather than big-bang development**
Data landscape and legal aspects: In-depth analysis of DK health care data landscape as well as legal aspects of using data for value based steering and support models show that DK has a good starting point.

**Diagnose of data landscape**

Detailed analysis of data availability/accessibility on national, regional, and municipal and hospital level.

**Summary of findings**

- Overall excellent data assets (in many areas, better prerequisites than Sweden); Patient reported outcomes lacking in many areas.
- Value based monitoring systems could be setup on regional level under current legislation.*
- Adjustments to reimbursement logic can be done under current legislating (e.g., bundled payments or capitation with performance targets on aggregated level) but with some restrictions in usage of data. Changes in legislation could be considered for the future.*

*Note: Details available in appendix and legal PM. Only high level legal assessment performed. Final conclusions subject to further analysis and in-depth legal review.
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Deep-dives: To assess potential and complexity for Denmark in deploying value-based steering and support systems, 10 selected medical conditions were analyzed in more depth.

**Process to select deep-dives**

- **Long-list of patient groups**
  - Long-list of patient groups selected based on:
    - Input from regional experts (DR steering group)
    - SVEUS groups
    - Top 15 in "Cost" (proxy for burden of disease)

- **Short-list**
  - Short-list derived based on:
    - Complexity (e.g., organizational)
    - Data availability

- **Deep-dives**
  - For each short-listed medical condition, data is gathered to evaluate:
    - Potential impact (e.g., burden of disease & variation)
    - "ease of implementation"

**Deep-dives:**
- Breast cancer
- Childbirth
- Diabetes
- Hip replacement
- Knee replacement
- Multiple Sclerosis
- Obesity surgery
- Prostate cancer
- Rheumatoid arthritis
- Stroke

Note: more details available in appendix
Deep-dives: For each medical condition, analysis has been performed to evaluate potential impact and ease of implementation (available in appendix)

Information gathered*

Key data sources

- Literature research (e.g., medical journals, case studies, other)
- Danish data sources:
  - Quality registers (for outcome data)
  - LPR
  - Other
- SVEUS insights if/when available (for patient group understanding, approximations and comparison)

Note: more details available in appendix

* Note: potential impact and “ease of implementation” in implementation of value-based steering and support systems
Synthesis of deep-dives: Improvement opportunity identified across selected patient groups, with likely highest short-term potential for groups that represent one-off procedures/treatments.

Approach (see appendix for details)

A Summary of potential by disease area

A1 Burden of disease
A2 Variation (cost and/or outcomes)

B Synthesis “Ease of implementation”
- Organizational complexity
- Data availability

Key inputs on patient group potential

<table>
<thead>
<tr>
<th>Disease Area</th>
<th>Complexity</th>
<th>Ease of Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Reumathoid arthritis</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Stroke</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Hip-replacement</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Knee-replacement</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Breast cancer</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Childbirth</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Obesity (surgery)</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
**Example analysis:** For childbirth, in depth quantitative analysis was performed on LPR-data to verify opportunity and ‘implementability’ of value based steering using existing data.

### Approach

* Deliveries identified in LPR (2012-2013) analysed
* Case-mix adjustment for maternal age and childbirth-specific factors
* Results presented at clinic level but name of clinic anonymized

<table>
<thead>
<tr>
<th>Comparison (type of indicator)</th>
<th>Take-away</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cesarean sections</strong> (treatment process)</td>
<td>• Significant variation in section rate across clinics (14% - 27% in observed rate) – significantly higher than Sweden&lt;br&gt;• Significant differences after case-mix adjustment</td>
</tr>
<tr>
<td><strong>Perineal tears</strong> (health outcome)</td>
<td>• Large variation in rate of perineal tears (2% - 6% in observed rate)&lt;br&gt;• Significant differences after case-mix adjustment</td>
</tr>
<tr>
<td><strong>Length of stay</strong> (resource use/cost)</td>
<td>• Significant variation in observed section rate across clinics (difference of up to 1,5 days)&lt;br&gt;• Significant differences after case-mix adjustment</td>
</tr>
</tbody>
</table>

* Note: details available in appendix

** Note: This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance within the health system.
Rough estimate on burden of disease for deep-dive patient groups

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Direct</th>
<th>Indirect</th>
<th>Burden of disease (DKK Billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Hip replacement</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Knee replacement</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>RA</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Obesity</td>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Child birth</td>
<td></td>
<td></td>
<td>1*</td>
</tr>
<tr>
<td>Prostate cancer</td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>~30-35</td>
</tr>
</tbody>
</table>

* Excluding indirect costs, and costs of maternity care and neonatal care

Source: Desk research; team analysis
Note: details available in appendix
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Roadmap: Thought starter on high level roadmap for Denmark - Simplified

**Step 0: Set up initial systems**
- Conduct coordinated development (R&D) projects for 10 selected patient groups:
  - Create team with national experts
  - Develop value based monitoring and reimbursement systems
  - Install value based monitoring systems for continuous monitoring and feedback of efficiency
  - Initiate benchmarking with Sweden
- Establish jointly coordinated continuous improvement programs for each of the patient groups and focus governance on efficiency
- Try reimbursement pilots locally: Implement changes to reimbursement system for a selection of patient groups or providers as test (to remove potential hinders from efficiency development)

**Step 1: Pilots – “Get started with new steering and support models”**

**Step 2: Short term evaluation and preparation for broader roll-out**
- Continued implementation activities:
  - Additional patient groups
  - Additional adjustment of reimbursement logic to support and stimulate efficiency development

**Step 3: Further roll-out**
- TBD

**General idea**

<table>
<thead>
<tr>
<th>Patient groups</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td>lead</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
</tr>
<tr>
<td>Region 2</td>
<td>participate</td>
<td>lead</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
</tr>
<tr>
<td>Region 3</td>
<td>participate</td>
<td>participate</td>
<td>lead</td>
<td>participate</td>
<td>participate</td>
</tr>
<tr>
<td>Region 4</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
<td>lead</td>
<td>participate</td>
</tr>
<tr>
<td>Region 5</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
<td>participate</td>
<td>lead</td>
</tr>
</tbody>
</table>

1) Does not need to be deep-dive groups from this report
2) Requires established collaboration Between Danish Regions and Sveus counties/regions
Roadmap: Significant advantages for collaboration between regions in development of value-based steering and support models

- Jointly defined KPIs enables benchmarking across regions and thereby sharing/learning best practices
- Consolidation of data from many regions for development will give more robust algorithms for case mix adjustment
- Joint development work enables efficient use of resources and scarce expertise (such as medical experts)
Key elements for a successful start

- Utilize developed systems from Sweden to get a running start and enable benchmarking
- Combine regional autonomy with the advantage of national collaboration
- Engage all concerned stakeholders early
- Show quick results

- Experience from Sweden shows that stakeholders tend to get more excited and involved when real data analysis is presented early
- Using Swedish systems as a starting point will enable benchmarking between Sweden and Denmark at levels never performed before
- Each region lead at least one area/patient group
- All regions contribute with medical expertise and data to all patient groups
- Sharing of other expertise within other fields such as resources to make IT/legal roadmap etc
- Propose organisation similar to Sveus
- Perform initial stake-holder analysis and engage all relevant stakeholders in development program early
  - E.g. Medical community, administrative personnel, at clinic, region, municipal and national levels
- Plan program to enable selected few pilots to show quick results as proof of concept and to keep engagement high from program participants as well as politicians
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  – Synthesis of key stakeholder interviews
  – Danish healthcare data prerequisites for adopting value based steering and support models
  – Deep-dives: Assessment of potential and “ease of implementation” of new steering models for ten selected patient groups
  – Example analysis on Childbirth based on Danish data
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### Overview of project deliverables (per January 2015)

#### Purpose of study

<table>
<thead>
<tr>
<th>Deliverables</th>
<th>Interviews</th>
<th>Desk research</th>
<th>Quantitative</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Assess starting point and general prerequisites for Denmark to adopt value-based steering and support models</strong></td>
<td><img src="image1" alt="Diagram" /></td>
<td><img src="image2" alt="Diagram" /></td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>High level diagnose of current governance model(s) based mainly on key stakeholder interviews</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Analysis of current patient data landscape and potential technical/legal constraints for enabling implementation of value based steering models</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td><strong>2) Assess potential and ‘implementability’ through deep-dives in selected patient groups</strong></td>
<td><img src="image4" alt="Diagram" /></td>
<td><img src="image5" alt="Diagram" /></td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>Analysis of availability/quality of relevant data (e.g. patient relevant outcome data and cost data)</td>
<td><img src="image7" alt="Table" /></td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>High level assessment of potential per patient group (e.g., variability in health outcomes and/or costs)</td>
<td><img src="image8" alt="Diagram" /></td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td><strong>3) Support Danish Regions to develop an action plan</strong></td>
<td><img src="image9" alt="Diagram" /></td>
<td><img src="image10" alt="Diagram" /></td>
<td><img src="image11" alt="Diagram" /></td>
</tr>
<tr>
<td>Proposed prioritization between patient groups to use for initial steering model pilots based on 1) potential for improved care and 2) complexity in implementation</td>
<td>✔️</td>
<td></td>
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</tr>
<tr>
<td>High-level action plan</td>
<td>✔️</td>
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</table>
Approach (per January 2015)

<table>
<thead>
<tr>
<th>Project Preparation</th>
<th>Phase 1: Conduct interviews and initiate data collection</th>
<th>Phase 2: Perform analysis</th>
<th>Phase 3: Conclude on recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>~4-6 weeks</td>
<td>~6-8 weeks</td>
<td>~2-3 weeks</td>
<td></td>
</tr>
</tbody>
</table>

1) Assess starting point and general prerequisites for Denmark to adopt value-based steering and support models

- Set up project governance (e.g., steering group)
- Interview stakeholders centrally to understand starting point e.g.,
  - Data availability
  - Governance structures
  - Understand tech. systems readiness
  - Outline legal considerations/ issues
- Collect complementary data

2) Assess potential and ‘ease of implementation’ through deep-dives in selected patient groups

- Compile aggregated data for selected patient groups with high healthcare spend; collect e.g.,
  - “Burden of disease” (including drivers e.g., incidence/ prevalence)
  - Indication of variability in treatment method/ results/ cost
  - Level of complexity
- Summarize benchmark (e.g., cost, health outcomes/frequency of complications) from other countries
- Make draft ranking of selected patient groups based on:
  - Potential impact on patient value (health/cost) through introducing new steering models
  - “Addressable share of potential” (i.e., ease of implementation, availability/ accessibility of data)

3) Support Danish Regions to develop an action plan

- Support interviews/workshops – on needs basis
- Summarize roadmap
- Anchor with key decision makers (e.g., clinical professionals and politicians) - on needs basis

- Make overview on data availabilities
- Make draft map of systems landscape (e.g. patient administrative systems, national databases)
- Outline potential legal issues
- Summarize high level observations of current governance structures
- Conclude on action plan based on identified issues (based on analysis in phase 2)
- Propose how to address each analysed patient group (e.g., monitoring and/or reimbursement system pilots)
### Workplan and timing (per January 2015)

<table>
<thead>
<tr>
<th>Activity</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep: Project Preparation</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Phase 1</strong>: Conduct interviews and initiate data collection</td>
<td></td>
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</tr>
<tr>
<td><strong>Phase 3</strong>: Conclude on recommendations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steering Groups (TBD)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- 6/2 2015
- 2015-04-01
## Team Setup

### Regional taskforce
- Jens Ole Skov (formand), Region Nordjylland
- Torben Hedegaard, Region Hovedstaden
- Mette Jensen, Region Midtjylland
- Jan Funder, Region Syddanmark
- Morten Koch, Region Sjælland
- Kristian Heunicke, Danske Regioner

### Steering Group
- Jens Ole Skov
- Mette Jensen
- Kristian Heunicke/Rikke Margrethe Friis

### Danish Region working group
- Kristian Heunicke/Rikke Margrethe Friis
- Pernille Moll (Project leader)
- Ditte-Marie Spang Sørensen

### IVBAR working team
- Project leadership: Johan Mesterton; Jonas Wohlin; Hans Lundstam
- Health economics expert: Peter Lindgren
- Informatics/Technical expert: Markus Eriksson
- Analyst: Anders Lundberg, Jacob Karlsson

### IVBAR support
- Senior support through Per Båtelson and Peter Aspelin
- Support in selected areas (when/where needed)
Content

- Background of feasibility study and case examples from Sweden
- Denmark starting point (organisational readiness and data landscape)
- High level assessment of potential for ten selected patient groups in Denmark
- Suggested roadmap for Denmark
- Appendix
  - Feasibility project governance
  - Synthesis of key stakeholder interviews
    - Danish healthcare data prerequisites for adopting value based steering and support models
    - Deep-dives: Assessment of potential and “ease of implementation” of new steering models for ten selected patient groups
    - Example analysis on Childbirth based on Danish data
Key stakeholder interviews: ~40 key leaders and experts have been interviewed to evaluate DK starting point and future vision

<table>
<thead>
<tr>
<th>Name</th>
<th>Organisation/Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kristian Heunicke</td>
<td>Danske Regioner</td>
</tr>
<tr>
<td>Rikke Margrethe Friis</td>
<td>Danske Regioner</td>
</tr>
<tr>
<td>Ditte S. Sørensen</td>
<td>Danske Regioner</td>
</tr>
<tr>
<td>Casper H. Mikkelsen</td>
<td>Danske Regioner</td>
</tr>
<tr>
<td>Niels Würgler Hansen</td>
<td>Finansministeriet</td>
</tr>
<tr>
<td>Søren Varder</td>
<td>Finansministeriet</td>
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<tr>
<td>Paul Bartels</td>
<td>RKKP</td>
</tr>
<tr>
<td>Mads Hansen</td>
<td>Ministeriet for Sundhed og Forebyggelse</td>
</tr>
<tr>
<td>Charlotte Houggard</td>
<td>Ministeriet for Sundhed og Forebyggelse</td>
</tr>
<tr>
<td>Svend Særkær</td>
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</tr>
<tr>
<td>Jan Funder</td>
<td>Syddanmark</td>
</tr>
<tr>
<td>Torben Hedegaard Jensen/ Søren Helsted</td>
<td>Hovedstaden</td>
</tr>
<tr>
<td>Poul Erik Hansen</td>
<td>Statens Seruminstitut</td>
</tr>
<tr>
<td>Ole Thomsen/Mette Jensen</td>
<td>Midtjylland</td>
</tr>
<tr>
<td>Carsten Lind</td>
<td>Midtjylland</td>
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<td>Poul Carstensen</td>
<td>Midtjylland</td>
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<tr>
<td>Morten Koch/Lene Jørndrup</td>
<td>Sjælland</td>
</tr>
<tr>
<td>Henrik Villadsen &amp; Teis Andersen</td>
<td>Roskilde &amp; Køge Sygehus</td>
</tr>
<tr>
<td>Kirsten Wisborg</td>
<td>Aarhus Universitetshospital</td>
</tr>
<tr>
<td>Tue Jensen</td>
<td>Rigshospitalet</td>
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<tr>
<td>Kasper Axel Nielsen</td>
<td>Foreningen af speciallæger</td>
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<tr>
<td>Morten Freil og Annette Wandel</td>
<td>Danske Patinter</td>
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<tr>
<td>Jes Søgaard</td>
<td>Kræftens Bekæmpelse</td>
</tr>
<tr>
<td>Jakob Kjellberg</td>
<td>Sundhedsøkonom, KORA</td>
</tr>
<tr>
<td>Katja Kayser</td>
<td>København Kommune</td>
</tr>
<tr>
<td>Per Stenberg Christensen/Eva Bartels</td>
<td>Region Hovedstaden</td>
</tr>
<tr>
<td>Helene Hedensted</td>
<td>Nordjylland</td>
</tr>
<tr>
<td>Marie Bussey Rask</td>
<td>Danske Regioner</td>
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<tr>
<td>Ann Vilhelmsen</td>
<td>Danske Regioner</td>
</tr>
<tr>
<td>Camilla Dürke Tybring</td>
<td>Danske Regioner</td>
</tr>
</tbody>
</table>
## Emerging perspective on starting point in DK (1/2)

**- What works well**

<table>
<thead>
<tr>
<th>Hypothesis/early perspective</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Macro indicators of overall effective health care delivery in DK compared to other countries</strong></td>
<td>’After all, we are one of the healthiest countries in the world’</td>
</tr>
<tr>
<td><strong>Improved productivity through DRG-system</strong></td>
<td>’Highly skilled and motivated healthcare professionals’</td>
</tr>
<tr>
<td><strong>Effective cost containment through new budget law and effective consequence management</strong></td>
<td>’In recent years, our increased focused on activities have enabled us to improve productivity’</td>
</tr>
<tr>
<td><strong>Improved access through national waiting time regulations</strong></td>
<td>’DRG has really helped us gain productivity’</td>
</tr>
<tr>
<td><strong>Successful centralization of specialist care</strong></td>
<td>’Essentially, you can never get more than your budget, although you could get less if you don’t achieve your targets’</td>
</tr>
<tr>
<td></td>
<td>’People are generally very good at keeping their budgets…if you can’t keep your budget, your are typically fired’</td>
</tr>
<tr>
<td></td>
<td>’Waiting times for select medical conditions are regulated by law’</td>
</tr>
<tr>
<td></td>
<td>’National regulations have been introduced in cancer and heart disease’</td>
</tr>
<tr>
<td></td>
<td>’our concentration to a few specialist institutions means that we can aggregate volumes and get really good on what we are doing’</td>
</tr>
</tbody>
</table>
Emerging perspective on starting point in DK (2/2) - What could be improved

<table>
<thead>
<tr>
<th>Hypothesis/early perspective</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need to shift focus in steering models from productivity to efficiency</td>
<td>’Some regions have started initiatives to continuously monitor health outcomes, but we see limited initiatives across regions’ ’We need to shift focus from productivity (activities and DRG-points) to efficiency’</td>
</tr>
<tr>
<td>Increase focus on outcomes that are relevant for patients</td>
<td>’Patient reported outcome measures are rarely measured and almost never used for organisation development or steering’ ’We often don’t measure outcomes that matter to our patients’</td>
</tr>
<tr>
<td>Improve the health care systems access to data</td>
<td>’We have so much valuable data but its very fragmented and not used to its full potential’ ’Much of the quality data is mainly used for research and not for quality improvement’</td>
</tr>
<tr>
<td>Improved collaboration between speciality care and primary care; Improved collaboration between regions and municipalities</td>
<td>’half of all Danes visit the hospital every year which is too much’ ’None in our system takes real responsibility for prevention’ ’It is difficult for us to find ways of working with the municipalities as it quickly becomes a question of who should carry the cost’</td>
</tr>
</tbody>
</table>
Content

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Broad overview of data landscape

- Health care data
  - Quality data
  - Drugs data
- Diagnostic data
- Municipal care data
- Adm health care data
- Cost data
- Social insurance data
- Sociodemographic data
- Mortality data
- Other data

Linking possibilities via CPR
Emerging perspective on data landscape with focus on regional level

### Type of information

<table>
<thead>
<tr>
<th>Level</th>
<th>Admin health care data/DRG</th>
<th>Cost per patient</th>
<th>Quality register</th>
<th>Drugs</th>
<th>Diagnostics</th>
<th>Municipal care</th>
<th>Socio demographic data</th>
<th>Mortality</th>
<th>Social insurance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital</td>
<td>Green</td>
<td>Black</td>
<td>Green</td>
<td>Blue</td>
<td>Green</td>
<td>Red</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>Municipal</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
<td>Black</td>
<td>Blue</td>
<td>Red</td>
<td>Black</td>
<td>Blue</td>
<td>Black</td>
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<tr>
<td>Regional</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
<td>Black</td>
<td>Blue</td>
<td>Red</td>
<td>Black</td>
<td>Blue</td>
<td>Black</td>
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<tr>
<td>National</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
<td>Black</td>
<td>Blue</td>
<td>Red</td>
<td>Blue</td>
<td>Blue</td>
<td>Blue</td>
</tr>
</tbody>
</table>

**Regional data availability:**
- Administrative data coupled with quality registers provides an excellent foundation for value-based steering and support models
- Certain, albeit not complete, information around cost per patient and usage of drugs is available
- Diagnostic data, as well as information around social insurance and date of death are also available
- Lack of certain details in primary care data and lack of municipal care data is a limiting factor

Hospitals have extensive data on their own patients

Limited data availability at municipal level

Very comprehensive data at national level, but quality register-data is lacking

Relevance for value-based steering:
- **Patient characteristics**
- **Care process**
- **Resource use/costs**
- **Health outcomes**

18 maj 2015
# Regional level data

## Patient characteristics

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical data</td>
<td>PAS/LPR</td>
<td>Comorbidities, age</td>
</tr>
<tr>
<td></td>
<td>Dansk receptdatabase</td>
<td>Use of anti-depressants</td>
</tr>
<tr>
<td></td>
<td>Quality Registers</td>
<td>Patient reported health, clinical characteristics</td>
</tr>
<tr>
<td></td>
<td>DREAM</td>
<td>Sick-leave, early retirement</td>
</tr>
<tr>
<td></td>
<td>Diagnostic databases</td>
<td>Cholesterol, HbA1c, x-rays</td>
</tr>
<tr>
<td>Socio-demographic data</td>
<td><strong>Socio-demographic data not available</strong></td>
<td>Country of birth, educational level</td>
</tr>
</tbody>
</table>

- Extensive data are available on patient characteristics
- Lack of socio-demographic data is a limiting factor. Sveus has shown that socio-demographic factors are strong predictors of outcomes and resource use
## Regional level data

### Care process

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical data</td>
<td>PAS/LPR</td>
<td>Use of procedures, visits and admissions</td>
</tr>
<tr>
<td></td>
<td>Dansk receptdatabase</td>
<td>Use of pharmaceuticals</td>
</tr>
<tr>
<td></td>
<td>Quality Registers</td>
<td>Detailed clinical parameters, PREMs</td>
</tr>
<tr>
<td></td>
<td>Diagnostic databases</td>
<td>Use of different diagnostics</td>
</tr>
<tr>
<td></td>
<td><strong>Municipal care data not available</strong></td>
<td>Use of rehabilitation, home care</td>
</tr>
</tbody>
</table>

- Overall, solid data are available on care process (slightly depending on level of detail available in quality registers – e.g. use of medical devices, imaging, referral information)
- Lack of certain details in primary care data (diagnosis information, exact date of visit) may limit complete understanding of the care process for certain patient groups (e.g. diabetes, COPD, cardiovascular diseases)
- Lack of municipal care data is a limiting factor for certain patient groups (e.g. stroke)
## Regional level data

### Resource use/costs

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional care activities and costs</td>
<td>PAS/LPR</td>
<td>Procedures, visits and admissions</td>
</tr>
<tr>
<td></td>
<td>Omkostningsdatabasen</td>
<td>Certain information on cost per patient</td>
</tr>
<tr>
<td></td>
<td>Dansk receptdatabase</td>
<td>Use and cost of pharmaceuticals</td>
</tr>
<tr>
<td></td>
<td>Quality Registers</td>
<td>Detailed clinical information on resource use</td>
</tr>
<tr>
<td>Social insurance data</td>
<td>DREAM</td>
<td>Sick-leave, early retirement</td>
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<tr>
<td>Municipal care data</td>
<td>Municipal care data not available</td>
<td>Use of rehabilitation, home care</td>
</tr>
</tbody>
</table>

- Comprehensive data on resource use available
- No complete coverage of resource use in primary care available
- Cost per patient data using activity-based costing is collected only at a few hospitals in Denmark. Omkostningsdatabasen is much less granular and not perfectly consistent across hospitals but it provides slightly more detail than DRG
## Regional level data
### Health outcomes

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>Date of death</td>
<td>Date of death</td>
</tr>
<tr>
<td></td>
<td>PAS/LPR</td>
<td>Diagnosis codes for inpatient death</td>
</tr>
<tr>
<td>Morbidity</td>
<td>PAS/LPR</td>
<td>Complications</td>
</tr>
<tr>
<td></td>
<td>DREAM</td>
<td>Return to work</td>
</tr>
<tr>
<td></td>
<td>Quality Registers</td>
<td>PROMs, detailed clinical outcomes</td>
</tr>
<tr>
<td></td>
<td>Dansk receptdatabase</td>
<td>Use of antidepressants, antibiotics</td>
</tr>
<tr>
<td></td>
<td>Diagnostic databases</td>
<td>Change in cholesterol, blood pressure, HbA1c</td>
</tr>
<tr>
<td></td>
<td>Municipal care data not available</td>
<td>Need for rehabilitation, home care</td>
</tr>
</tbody>
</table>

- Information about mortality is captured, but not information on cause of death
- Data on complications give information about health outcomes achieved
- Pharmaceutical use, diagnostics and also return to work provide information can all be used as indicators of health outcomes.
- Moreover, more detailed clinical outcomes are available in several quality registers
- Patient reported outcomes are collected only in a few quality registers
## National level data

### Patient characteristics

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical data</td>
<td>LPR</td>
<td>Comorbidities, age</td>
</tr>
<tr>
<td></td>
<td>Lægemiddelstatistikregisteret</td>
<td>Use of anti-depressants</td>
</tr>
<tr>
<td></td>
<td><strong>Quality Registers not available</strong>*</td>
<td>Clinical characteristics, comorbidities</td>
</tr>
<tr>
<td></td>
<td>DREAM</td>
<td>Sick-leave, early retirement</td>
</tr>
<tr>
<td></td>
<td>Diagnostic databases</td>
<td>Cholesterol, HbA1c, x-rays</td>
</tr>
<tr>
<td>Socio-demographic data</td>
<td>Statistics Denmark’s databases</td>
<td>Country of birth, educational level</td>
</tr>
</tbody>
</table>

- Extensive data are available on patient characteristics, including socio-demographic data
- Certain clinical characteristics may be lacking in the absence of quality register data

* A limited number of quality databases are based on information from national databases and these are available at national level
**National level data**

**Care process**

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
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<tbody>
<tr>
<td>Clinical data</td>
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<td>Use of procedures, visits and admissions</td>
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<td>Diagnostic databases</td>
<td>Use of different diagnostics</td>
</tr>
<tr>
<td></td>
<td>KØS</td>
<td>Use of rehabilitation, home care</td>
</tr>
</tbody>
</table>

* Solid data are available on the care process, including data on municipal care
* Lack of quality register data hampers possibility to follow more detailed clinical parameters that may be of interest (e.g. use of medical devices, imaging, referral information)

* A limited number of quality databases are based on information from national databases and these are available at national level
## National level data

### Resource use/costs

<table>
<thead>
<tr>
<th>Type of information</th>
<th>Data source</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regional care activities and costs</td>
<td>LPR</td>
<td>Procedures, visits and admissions</td>
</tr>
<tr>
<td></td>
<td>Omkostnungsdbasen</td>
<td>Estimated cost per patient</td>
</tr>
<tr>
<td></td>
<td>Lægemiddelstatistikregisteret</td>
<td>Use and cost of pharmaceuticals</td>
</tr>
<tr>
<td></td>
<td><strong>Quality Registers not available</strong>*</td>
<td>Detailed clinical information on resource use</td>
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<td>Social insurance data</td>
<td>DREAM</td>
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*A limited number of quality databases are based on information from national databases and these are available at national level*
# National level data

## Health outcomes

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<tr>
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<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality</td>
<td>Dødsårsagsregistret</td>
<td>Date of death</td>
</tr>
<tr>
<td></td>
<td>LPR</td>
<td>Diagnosis codes for inpatient death</td>
</tr>
<tr>
<td>Morbidity</td>
<td>DREAM</td>
<td>Complications</td>
</tr>
<tr>
<td></td>
<td>Quality Registers not available*</td>
<td>Return to work</td>
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<td></td>
<td>KØS</td>
<td>Need for rehabilitation, home care</td>
</tr>
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</table>

- Data on complications, pharmaceutical use, return to work and mortality gives information about health outcomes achieved
- However, lack of quality register data poses a challenge to understanding patient relevant health outcomes including PROMs and clinical outcomes

* A limited number of quality databases are based on information from national databases and these are available at national level
High level legal analysis (1/2)
- Legal questions and data sources/databases

**Legal questions**

The Danish Regions wish to use data for two purposes related to governance:

1. **Using data for monitoring/analysis of health outcomes, resource use and other indicators** - Data from different providers and data sources will be linked on patient-level using CPR number and will be reported back to regions/hospitals/clinics on a aggregated level (without possibility to identify individual patients)

2. **Using data for changes to reimbursement logic** - Data from different providers and data sources will be linked on patient-level using CPR number to determine reimbursement

**Databases**

- Patient Administrative Systems (patientadministrative systemer)
- Danish National Patient Registry (Landspatientregisteret)
- Cost Database (Patientrelateret Omkostningsdatabase)
- The Danish National Database of Reimbursed Prescriptions (Dansk Receptdatabase)
- Clinical Quality Databases (kliniske kvalitetsdatabaser)
- Danish Register for Evaluation of Marginalisation (Dansk Register for Evaluering af Marginalisering (DREAM))
- Diagnostics Databases (diagnose databaser)
### High level legal analysis (2/2)
- Legal questions and data sources/databases

#### Legal questions

The Danish Regions wish to use data for two purposes related to governance:

1. **Using data for monitoring/analysis of health outcomes, resource use and other indicators**
   - Data from different providers and data sources will be linked on patient-level using CPR number and will be reported back to regions/hospitals/clinics on an aggregated level (without possibility to identify individual patients)

2. **Using data for changes to reimbursement logic**
   - Data from different providers and data sources will be linked on patient-level using CPR number to determine reimbursement

#### Conclusions from high level legal assessment*

It is our preliminary assessment that the Danish Regions would be entitled to process personal data from most of the databases as included in the previous slide for the purpose of monitoring and analysis under Danish law. However, the processing will be subject to compliance with the general rules of the APPD and the prior notification to (and opinion from) the DDPA and/or the DHMA. Furthermore, the scope of the personal data, if any, which the Danish Regions may legally obtain access to will be subject to the assessment of the data controller for each data-base.*

It is our preliminary assessment that the Danish Regions would not be entitled to process personal data from the databases covered by this memo for the purpose of determining reimbursement based on patient-level data on a general basis across sectors under Danish law. Aggregated data could however be used.*

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* Note: Details available in legal PM. Only high level legal assessment performed. Final conclusions subject to further analysis and in-depth legal review.
Content

• Background of feasibility study and case examples from Sweden
• Denmark starting point (organisational readiness and data landscape)
• High level assessment of potential for ten selected patient groups in Denmark
• Suggested roadmap for Denmark

• Appendix
  – Feasibility project governance
  – Synthesis of key stakeholder interviews
  – Danish healthcare data prerequisites for adopting value based steering and support models
    • Deep-dives: Assessment of potential and “ease of implementation” of new steering models for ten selected patient groups
  – Example analysis on Childbirth based on Danish data
Process to select deep-dives

- Long-list of patient groups
  - Long-list of patient groups selected based on:
    - Input from regional experts (DR steering group)
    - SVEUS groups
    - Top 15 in "Cost" (proxy for burden of disease)

- Short-list
  - Short-list derived based on:
    - Complexity (e.g., organizational)
    - Data availability

- Deep-dives
  - For each short-listed medical condition, data is gathered to evaluate:
    - Potential impact (e.g., burden of disease & variation)
    - "ease of implementation"

Note: more details available in appendix
# Long-list of patient groups for deep-dives

## Cost of specialized care (inpatient and outpatient grouped by primary diagnosis)

### Production cost in 2013, Millions DKR (inpatient and outpatient care)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Deep-dives</th>
<th>SVEUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Childbirth</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Spine disease/back pain</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Respiratory insufficiency</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Renal insufficiency</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>Lung cancer</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Knee arthritis</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Breast cancer **</td>
<td>0.8**</td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Malign tumour</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Colon cancer</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Hip arthritis</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Femoral fracture</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Sepsis</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Leukemia</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Retinopathy</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Heart failure</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Nonrheumatic aortic valve disorders</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Angina pectoris</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Chronic ischaemic heart disease</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>Rectal cancer</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Neonatal care</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Gallstone</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Lower leg fracture</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Lymphoma</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Arm fracture</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Obesity (bariatric surgery) **</td>
<td>TBD</td>
<td></td>
</tr>
</tbody>
</table>

---

**Selected long list based on criteria:**
- SVEUS patient groups
- Expert opinion
- Top 15 in "Cost" (proxy for burden of disease)

---

**Note:** Diagnoses groups may not correspond to relevant patient groups for the value based framework (to be determined)

* Patients with one or more specialized care contact with a matching primary diagnosis during 2013

** Rough estimate/Extrapolation based on Swedish numbers

Source: LPR 2013. Cost calculation based on Totpris_genop (inpatient care) and Pris (outpatient care)
Synthesis of deep-dives

Approach

A Summary of potential by disease area

A1 Burden of disease

A2 Variation (cost and/or outcomes)

B Synthesis “Ease of implementation”
  • Organizational complexity
  • Data availability

INDICATIVE
 Complex

“Ease of implementation”

Low

Potential

High

Diabetes
Reumatoid arthritis
Multiple sclerosis
Hip-replacement
Knee-replacement
Stroke
Breast cancer
Childbirth
Prostate cancer
Obesity (surgery)
## Key inputs on patient group potential

<table>
<thead>
<tr>
<th>Condition</th>
<th>Prevalence Per 100'</th>
<th>Incidence Per 100'</th>
<th>A1 Burden of disease DKK billion</th>
<th>A2 Indication of Variation</th>
<th>A Overall potential***</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Breast cancer              | N/A                 | 143                | 1,9                              |                           | [●]                    | • High incidence  
• Variability in recurrence observed |
| Childbirth                 | N/A                 | 1 033              | 0,8*                             |                           | [●]                    | • High volumes  
• Impact on neonatal care |
| Diabetes                   | 6 700               | 424                | 10,3                             |                           | [●]                    | • High and increasing prevalence  
• Very large disease burden |
| Hip replacement            | N/A                 | 160                | 3,5                              |                           | [●]                    | • High incidence and burden  
• Large variability observed |
| Knee replacement           | N/A                 | 118                | 2,9                              |                           | [●]                    | • High incidence and burden  
• Large variability observed |
| Multiple sclerosis         | 220                 | 8                  | 1,8                              |                           | [●]                    | • Large variation observed in both outcomes and care process |
| Obesity (bariatric surgery)| 7 200               | 17**               | 2,5                              |                           | [●]                    | • Only minor part of obesity burden assessed by surgery |
| Prostate cancer            | N/A                 | 138                | 0,8                              |                           | [●]                    | • Variability in complications and care process observed |
| Rheumatoid arthritis       | 750                 | 31                 | 2,6                              |                           | [●]                    | • Large disease burden  
• Costly pharmaceutical treatments |
| Stroke                     | N/A                 | 612                | 2,4                              |                           |                        | • High indirect costs  
• Very large variation observed in Danish registry |

** *Excluding indirect cost and costs of maternity care and neonatal care  
** ** Number of bariatric surgeries per 100 000 inhabitants  
*** Based 75% on burden of disease and 25% on variability
# Exemplary indicators on variation in outcomes/costs

<table>
<thead>
<tr>
<th>Patient groups</th>
<th>Indication of variation</th>
<th>Examples of indicator variation (not exhaustive)*</th>
</tr>
</thead>
</table>
| Breast cancer    | • Share of patients with recurring cancer in 5 years following breast preserving treatments varies between 0.7 % (Aalborg) and 2.0 % (HJØRRING)  
• Share of patients without surgery related complications in 30 days varies between 91 % (Esbjerg) and 100% (Ringsted) |                                                   |
| Childbirth       | • C-section rate varies between 15.4% (Sønderborg) and 26.1% (Odense/Svendborg).  
• Apgar score 9-10 (measure of good fetal health) varies between 93.8% (Esbjerg) and 97.7% (Hvidovre). |                                                   |
| Diabetes         | • Share of patients progressing to severe diabetic retinopathy varies between 0 % (Hillerød) and 38 % (Roskilde)  
• Median HbA1c for T2DM patients in specialized care varies between 50 mmol/mol (Gentofte) and 66 (Bornholm) |                                                   |
| Hip replacement  | • Implant revision in 2 years (primary arthrosis), Hospital: 0.0 % (Thy-Mors Thisted) - 6.9 % (Holbæk)  
• Implant survival 5 years (primary arthrosis), Hospital: 91.0 % (Sydvestjysk Grindsted) ) - 100 % (Several) |                                                   |
| Knee replacement | • Regional level variation: 5-year arthroplasty revision rate, 3.2 % - 9.2 %  
• Length of hospital stay for TKA, 2.6 (Privathospitaler) - 4.0 (Nordjylland). Average 3.3 days |                                                   |
| Multiple sclerosis | • Share of patients under treatment and with a starting EDSS score of 4 or less, reaching a EDSS score of 4 or more (endpoint) after 5 years of follow-up varies between 47 % (Roskilde) and 94 % (Hillerød)  
• Share of patients working full time when starting treatment not doing so at 5 year follow-up varies between 20 % (Rigshospitalet) and 90 % (Herlev) |                                                   |
| Obesity surgery  | • Excess body mass index loss more than 50 % in 1 year varies between 85 % (Sydvestjysk) and 96 % (Aalborg)  
• Improvements (yes or no) in HRQoL (Moorehead) varies between 84 % (Sydvestjysk) and 100 % (Aalborg, OUH Svendborg)  
• Readmission frequency in 30 days varies between 2 % (Privathospitalen) and 14 % (Viborg) |                                                   |
| Prostate cancer  | • Share of patients with urethral stricture complications within 1 year varies between 1 % (Aalborg) and 7 % (Hosp. Vest)  
• Share of patients receiving nerve preserving surgical procedures varies between 82 % (Rigshospitalet) and 46 % (Aalborg) |                                                   |
| Rheumatoid arthritis | • Share of patients, treated with biological drugs, with improved or stationary level of functionality varies between 64 % (Holbæk) and 100 % (Frederica)  
• Share of patients, treated with biological drugs, with improved or stationary level of pain varies between 87 % (Rigshospitalet) and 100 % (Frederica) |                                                   |
| Stroke           | • 30 day mortality varies between 6 % (Amager) and 55 % (HE Midt); equivalent figures in Sweden span 5 % to 17 %  
• Share of patients being readmitted in 30 days varies between 0 % (Dronninglund) and 22 % (Amager); readmittance rates in Sweden vary between 36 % and 57 % |                                                   |

* Note: Variations in indicators are not adjusted for possible differences in casemix
### Key inputs on “ease of implementation”

<table>
<thead>
<tr>
<th>Condition</th>
<th>Organizational complexity</th>
<th>Data availability</th>
<th>Overall implementability*</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast cancer</td>
<td>High Low Low</td>
<td></td>
<td>• Excellent data availability • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Childbirth</td>
<td>High Low</td>
<td></td>
<td>• Excellent data availability and well defined episode • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td>Medium High Low</td>
<td></td>
<td>• High primary care involvement adds complexity • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Hip replacement</td>
<td>High Low</td>
<td></td>
<td>• Excellent data availability and well defined episode • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Knee replacement</td>
<td>High Low</td>
<td></td>
<td>• Excellent data availability and well defined episode • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Multiple sclerosis</td>
<td>High Low Medium</td>
<td></td>
<td>• Good data availability • Certain primary care and municipal care involvement</td>
<td></td>
</tr>
<tr>
<td>Obesity surgery</td>
<td>High Low</td>
<td></td>
<td>• Excellent data availability • Experience from Sveus</td>
<td></td>
</tr>
<tr>
<td>Prostate cancer</td>
<td>High Low Low</td>
<td></td>
<td>• Excellent data availability • ICHOM has proposed indicator standard sets</td>
<td></td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>High Low Medium</td>
<td></td>
<td>• Excellent data availability • Certain primary care and municipal care involvement</td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>High Low High</td>
<td></td>
<td>• High municipal care involvement • Experience from Sveus</td>
<td></td>
</tr>
</tbody>
</table>

* Based 50% on complexity and 50% on data availability
Assessment of potential impact in Childbirth

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burden of disease</td>
<td>Prevalence</td>
</tr>
<tr>
<td>Epidemiological</td>
<td>NA</td>
</tr>
<tr>
<td>measures</td>
<td>Incidence</td>
</tr>
<tr>
<td></td>
<td>1 033 per 100 000&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Costs</td>
<td>Direct costs</td>
</tr>
<tr>
<td></td>
<td>830 million DKK&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Indirect costs</td>
</tr>
<tr>
<td>Identified variation</td>
<td>Outcomes</td>
</tr>
<tr>
<td></td>
<td>Among clinics with &gt;1000 births/year, Apgar score 9-10 (measure of good foetal health) varies between 93.8% (Esbjerg) and 97.7% (Hvidovre) &lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Among clinics with &gt;1000 births/year, Severe perineal tears (grade 3-4) varies between 5.5% (Hvidovre) and 7.0% (Odense/Svendborg) &lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Resource use</td>
</tr>
<tr>
<td></td>
<td>C-section rates vary (see below). Data from LPR indicates that LoS following c-section (DO82) is 4 days compared to 2 days following spontaneous vaginal delivery (DO80). Moreover, per diem cost for c-section is expected to be higher for c-sections. Together, this indicates variation in resource use associated with childbirth. &lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Care process</td>
</tr>
<tr>
<td></td>
<td>Among clinics with &gt;1000 births/year, C-section rates varies between 15.4% (Sønderborg) and 26.1% (Odense/Svendborg). Emergency c-section varies between 9.5% (Sønderborg) and 15.6% (Odense/Svendborg). &lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

**Substantial potential in terms of better resource use and quality improvements**

- High volumes and high health care costs, especially when including costs of maternity care and neonatal care
- Relatively large variation among clinics in mode of delivery, which is linked to health outcomes and resource use
- Variation among clinics in the rate of foetal and maternal complications

**Sources:**

<sup>1</sup> Dansk Kvalitetsdatabase for Fødsler, Årsrapport 2013

<sup>2</sup> Team analysis based on Bellanger et al. What can we learn from a cross-country comparison of the costs of child delivery? Health Econ. 17: S47–S57 (2008);

Socialstyrelsen Öppna jämförelser 2013 Hälso- och sjukvård. Excludes indirect cost and costs of maternity care and neonatal care

<sup>3</sup> Landspatientregistret

* Note: more details available in appendix
# Assessment of Ease of implementation in Childbirth

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational complexity</td>
<td></td>
</tr>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>X</td>
</tr>
<tr>
<td>Municipal care</td>
<td></td>
</tr>
</tbody>
</table>

**M=Missing**  
- Regional and national level  
- Regional level  
- National level

## Measures type

### Patient characteristics
- Sociodemographic information
  - Information source types: Adm. Care db 1, Dual. reg 2, Cost db 3, Drug db 4, Diagnostic db 5, Municipal care db 6, Claims of medical db 7, Social Insurance db 8, Socio-demographic db 9

### Care process
- Comorbidities
- Other clinically relevant characteristics

### Health outcome indicators
- Mortality
- Objective outcomes
- PROMs

### Health outcomes (patient relevant)
- Short and long term outcomes
- Objective outcomes
- PROMs

### Process of recovery
- Time to recovery

## Information sources:
1. PAS/Landsygehusregister (LPR)
2. Dansk Kvalitetsdatabase for Fødsler og Dansk Følmedicinsk Database
3. Omkostningsdatabaser
4. Dansk receptdatabase or Lægemiddelstatisikregisteret
5. KØS (Københavns Kommunes Sørgeskridte) (only date of death at regional level)
6. DREAM (Various databases at Statistics Denmark)

## Examples of existing potentially relevant variables

* Note: more details available in appendix

---

Limited organizational complexity

Satisfactory data availability to get started with improved monitoring

PROMs and PREMs need to be complemented longer term
Assessment of breast cancer: Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>NA</td>
</tr>
<tr>
<td>Incidence</td>
<td>143 per 100 000&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Direct costs</td>
<td>600 million DKK&lt;sup&gt;2,3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>1.3 billion DKK&lt;sup&gt;2,3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Share of patients with recurring cancer in 5 years following breast preserving treatments varies between 0.7 % (Aalborg) and 2.0 % (HJØRRING)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of patients without surgery-related complications in 30 days varies between 91 % (Esbjerg) and 100 % (Ringsted)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of patients mapped using sentinel node biopsy varies between 91 % (HJØRRING) and 100 % (Aalborg)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of high risk patients receiving adjuvant medical treatment varies between 61 % (SØNDERBORG) and 93 % (Vejle, HILLERØD)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

**Relatively high potential in terms of disease burden. Indication of certain variation across hospitals.**

- One of the cancer types with highest incidence
- Variability in disease recurrence observed between hospitals
- Variability in extent of adjuvant medical treatment also observed

**Sources:**

4. Landsdækkende Klinisk Kvalitetsdatabase for Brystkraeft
## Assessment of breast cancer: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organizational complexity</strong></td>
<td></td>
</tr>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>(X)</td>
</tr>
<tr>
<td>Municipal care</td>
<td>(X)</td>
</tr>
</tbody>
</table>

M=Missing

### Information source types

<table>
<thead>
<tr>
<th>Adequacy level</th>
<th>Measures type</th>
<th>Information source types</th>
<th>Information available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient characteristics</td>
<td>Sociodemographic information</td>
<td>Adm. Care db</td>
<td>Regional and national level</td>
</tr>
<tr>
<td></td>
<td>Comorbidities</td>
<td>Regional</td>
<td></td>
</tr>
<tr>
<td>Health profile</td>
<td>Other clinically relevant characteristics</td>
<td>National level</td>
<td></td>
</tr>
<tr>
<td>Treatment process</td>
<td></td>
<td>Regional</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td>National level</td>
<td></td>
</tr>
<tr>
<td>Resource use/costs</td>
<td></td>
<td>Regional and national level</td>
<td></td>
</tr>
<tr>
<td>PREMs</td>
<td></td>
<td>National level</td>
<td></td>
</tr>
<tr>
<td>Health outcome indicators</td>
<td></td>
<td>Regional and national level</td>
<td></td>
</tr>
<tr>
<td>Health outcomes (patient relevant)</td>
<td>Short and long term outcomes</td>
<td>Regional and national level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Objective outcomes</td>
<td>National level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROMs</td>
<td>Regional</td>
<td></td>
</tr>
<tr>
<td>Process of recovery</td>
<td>Complications</td>
<td>Regional and national level</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Time to recovery</td>
<td>National level</td>
<td></td>
</tr>
</tbody>
</table>

**Example of relevant data missing**

- Tumor type/prognosis
- PREMs
- PROMs missing

**Excellent data availability**

- Available data covers many aspects of value based steering
- Lack of municipal data at regional level a slight limitation
- PROMs missing

### Information sources:

1. PAS/Landspatientregistret (LPR)
2. Landsdækkelæge Klinisk Kvalitetsdatabase for Brystkæft
3. Omkostningsdatabaser
4. Dansk receptdatabaser eller Lægemiddelstatistikregistret
5. KØS (Københavns Økonomi og Statistik for sundhedsområdet)
6. DREAM (Various databases at Statistics Denmark)
7. PREMs (Related to recovery process and complications)
8. Use of adjuvant drugs
9. History of sick leave
10. Educational level, civil status, country of birth
11. Elixahuser Comorbidity Index
12. Charlson Comorbidity Index
13. Drug use reflecting comorbidities
14. Metastatic disease
15. Possibility to extract data on prognostic factors
16. Number of visits in specialised outpatient care
17. Type of surgery, Removal of axillary lymph nodes, Adjuvant medical treatment for high risk patients, Adjuvant radiotherapy, Preoperative diagnose using needle biopsy, Malignant surgery ratio, Participation in 5 year follow-up
18. Related mainly to treatment process and complications
19. Use of adjuvant drugs
20. Sick leave after surgery
21. Local recurring tumors for breast preserving technique, Absence of lymph node metastasis, Late sentinel node metastasis
22. ER-visits due to drug-induced infections
23. Absence of surgical complications
Assessment of diabetes: Potential

<table>
<thead>
<tr>
<th>Burden of disease</th>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prevalence</td>
<td>6,700 per 100,000¹</td>
</tr>
<tr>
<td>Epidemiological measures</td>
<td>Incidence</td>
<td>424 per 100,000¹</td>
</tr>
<tr>
<td>Costs</td>
<td>Direct costs</td>
<td>3.8 billion DKK²</td>
</tr>
<tr>
<td></td>
<td>Indirect costs</td>
<td>6.4 billion DKK²</td>
</tr>
</tbody>
</table>

**Outcomes**

- Share of patients in specialized care progressing to severe diabetic retinopathy varies between 0% (Hillerød) and 38% (Roskilde)³
- Share of patients with no signs of retinopathy varies between 17% (Roskilde) and 75% (Slagelse)³
- Median HbA1c for diabetes type 2 patients in specialized care varies between 50 mmol/mol (Gentofte) and 66 (Bornholm)³
- Share of diabetes type 1 patients in specialized care with strict glycemic control HbA1c < 53 mmol/mol varies between 31% (Amager) and 14% (Glostrup, Vendsyssel)³

**Resource use**

- In T2DM. Mean annual number of primary care contacts varies between 14.4 (Region Hovedstaden) and 16.4 (Region Syddanmark). Mean annual number of contacts with specialist physician varies between 1.1 (Region Syddanmark) and 2.3 (Region Hovedstaden)⁴

**Very large potential in terms of epidemiology and disease burden**

- High, and increasing, disease prevalence
- Societal burden of diabetes amounts to around 10 billion DKK annually
- Certain variation in outcomes and resource use observed

**Sources:**

³ Dansk Diabetes Database
⁴ SSI: Patienter med type-2 diabetes’ kontaktforbrug i det regionale sundhedsvesen
# Assessment of diabetes: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational complexity</th>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Primary care</td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>Municipal care</td>
<td>X</td>
</tr>
</tbody>
</table>

- **M=Missing**
- **Regional and national level**
- **Regional level**
- **National level**

## Data availability

### Measures type

- **Patient characteristics**
  - Sociodemographic information: X
  - Comorbidities: X
  - Other clinically relevant characteristics: X

- **Care process**
  - Treatment process: X
  - Time: X
  - Resource use/costs: X
  - PREMs: X

- **Health outcome indicators**
  - Short and long term outcomes: X

- **Health outcomes (patient relevant)**
  - Mortality: X
  - Complications: X
  - Time to recovery: X

### Information source types

- **Adm. Care db**: X
- **Qual. reg**: X
- **Cost db**: X
- **Drug db**: X
- **Diagnostic db**: X
- **Municipal care db**: X
- **Cauces of death db**: X
- **Social insurance db**: X
- **Sociodemographic db**: X

### Example of relevant data missing

- Physical activity
- PREMs

## Information sources:

1. PAS/Landspatientregistret (LPR)
2. Dansk Diabetes Database (not complete coverage in primary care)
3. Omkostningsdatabasen
4. Dansk receptdatabase or Lægmedicinskatablisterkregistreret
5. KØS
6. Dødsårssagregistret (only date of death at regional level)
7. DREAM: Various databases at Statistics Denmark
8. Examples of existing potentially relevant variables

- **Age**
- **History of sick leave**
- **Educational level**
- **Civil status, country of birth**
- **Comorbidity index (Elixhauser, Charlson)**
- **Body mass index (BMI)**
- **Smoking**
- **Duration of diabetes condition**
- **Primary diagnosis (type of diabetes)**
- **LDL cholesterol, microalbuminuria**
- **Number of outpatient visits to different health care professionals**
- **Share of patients annually assessed for glycemic control (HbA1c)**
- **Blood pressure, albumin in the urine, retinal status and feet status**
- **Share of patients with diabetes and hypertension not offered antihypertensive treatment**
- **Share of patients with type 2 diabetes, over 30 years of age, elevated LDL-cholesterol and not on statin medication**
- **Share of patients with albuminuria not under ACE/ATII treatment**
- **Metformin (biguanides), sulphonylureas, glitnider, alpha-glucosidase inhibitors, glitazones**
- **Sick leave**
- **Share of patients with adequate glycemic control (HbA1c <53 mmol/mol), Systolic and diastolic pressure, Cholesterol levels**
- **Prevalence and status of complications**
- **Prevalence of complications (neurologic, feet, eye, cardio- or cerebrovascular events)**
- **Retinopathies and maculopathies, prevalence of blindness**
Assessment of hip replacement: Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence</td>
<td>NA</td>
</tr>
<tr>
<td>Incidence</td>
<td>160 per 100 000</td>
</tr>
<tr>
<td>Direct costs</td>
<td>700 million DKK(^1)</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>2.8 billion DKK(^2)</td>
</tr>
</tbody>
</table>

**Identified variation**

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Implant revision in 2 years (primary arthrosis), Hospital: 0.0 % (Thy-Mors Thisted) - 6.9 % (Holbæk)(^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implant survival 5 years (primary arthrosis), Hospital: 91.0 % (Sydvestjysk Grindsted) - 100 % (Several)(^3)</td>
</tr>
<tr>
<td></td>
<td>Implant survival 5 years (primary arthrosis), Regional: 94.8 % (Hovedstaden) - 96.5 % (Midtjylland).(^3)</td>
</tr>
<tr>
<td></td>
<td>Readmission arthroplasty related problems, Hospital: 0.8 % (Frederiksberg Hospital) - 8.2 % (Hvidovre Hospital)(^3)</td>
</tr>
<tr>
<td></td>
<td>Readmission arthroplasty related problems, Regional: 3.1 % (Nordjylland) - 5.2 % (Hovedstaden).(^3)</td>
</tr>
<tr>
<td>Care process</td>
<td>Blood transfusion, Hospital: 1.0 % (Privathospitalet Hamlet) - 46.5 % (Sygehus Thy-Mors Thisted)(^3)</td>
</tr>
<tr>
<td></td>
<td>Blood transfusion, Regional: 10.6 % (Midtjylland) - 21.3 % (Nordjylland).(^3)</td>
</tr>
</tbody>
</table>

**Large potential in terms of disease burden and there are indications of variation in outcomes**

- Relatively frequent surgical procedure in osteoarthritis
- Large variation observed in implant revision and survival, as well as readmissions (all of which reflect health outcomes but are also strongly linked to resource use)
- Large variation in proportion of patients receiving blood transfusion

**Sources:**

1 Team analysis based on Dansk Hoftealloplastik Register Årsrapport 2013 and Öppna jämförelser 2013 (Sveriges Kommuner och Landsting)
2 Team analysis based on Schmidt A, Husberg M och Berntfors L. Samhällsekonomiska kostnader för reumatiska sjukdomar 2003
3 Dansk Hoftealloplastik Register Årsrapport 2013
Assessment of hip replacement: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>(X)</td>
</tr>
<tr>
<td>Municipal care</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measures type</th>
<th>Information source types</th>
<th>Example of relevant data missing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adm. Care db</td>
<td>Qual. reg</td>
</tr>
<tr>
<td>Patient characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health profile</td>
<td>X12</td>
<td>X13</td>
</tr>
<tr>
<td>Comorbidities</td>
<td>X10</td>
<td></td>
</tr>
<tr>
<td>Other clinically relevant characteristics</td>
<td>X11</td>
<td></td>
</tr>
<tr>
<td>Treatment process</td>
<td>X9</td>
<td>X10</td>
</tr>
<tr>
<td>Time</td>
<td>X8</td>
<td>M</td>
</tr>
<tr>
<td>Resource use/costs</td>
<td>X7</td>
<td></td>
</tr>
<tr>
<td>PREMs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health outcomes (patient relevant)</td>
<td>X15</td>
<td>X16</td>
</tr>
<tr>
<td>Short and long term outcomes</td>
<td>X19</td>
<td>X20</td>
</tr>
<tr>
<td>Mortality</td>
<td>X21</td>
<td></td>
</tr>
<tr>
<td>Objective outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROMs</td>
<td>X22</td>
<td>X23</td>
</tr>
<tr>
<td>Process of recovery</td>
<td>X24</td>
<td>X25</td>
</tr>
<tr>
<td>Complications</td>
<td>X26</td>
<td></td>
</tr>
<tr>
<td>Time to recovery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Information sources:
1 PAS/Landspatientregistreret (LPR)
2 Dansk Fedmekirurgiregister, Årsrapport 2013
3 Omkostningsdatabaser
4 Dansk receptdatabase or Lægemiddelstatistikregisteret
5 KØS 6 Dødsårsagsregistret (only date of death at regional level)
7 DREAM 8 Various databases at Statistics Denmark

Examples of existing potentially relevant variables
9 Age, sex 10 Sick-leave before and after operation 11 Educational level, civil status, country of birth 12 Comorbidity index (Elixhauser, Charlson) 13 Additional comorbidities 14 Anti-depressants 15 Bilateral operation 16 Charnley category, weight, length, BMI, ASA etc 17 Operation method, procedure specifics etc 18 Resources and costs related to initial hospital stay, readmissions and revisits 19 Return to employment 20 Implant survival, implant revisions, readmissions for different causes 21 Orthopedic and non-orthopedic complications 22 Blood transfusions 23 Antibiotics

Low organizational complexity

Excellent data availability
- Available data is suitable for value based steering
- PROMs are missing and should be considered to be collected

Deep-dives
Assessment of knee replacement: Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burden of disease Epidemiological measures</td>
<td>Prevalence</td>
</tr>
<tr>
<td></td>
<td>Incidence</td>
</tr>
<tr>
<td>Costs</td>
<td>Direct costs</td>
</tr>
<tr>
<td></td>
<td>Indirect costs</td>
</tr>
<tr>
<td>Identified variation</td>
<td>Outcomes</td>
</tr>
<tr>
<td></td>
<td>Regional level variation: Mortality rate 90 days, 0.2% - 0.7%. Average 0.4%³</td>
</tr>
<tr>
<td></td>
<td>Regional level variation: 1-year arthroplasty revision rate, 1.5% - 8.2%. Average 2.9%³</td>
</tr>
<tr>
<td></td>
<td>Regional level variation: 2-year arthroplasty revision rate, 2.3% - 6.6%. Average 3.8%³</td>
</tr>
<tr>
<td></td>
<td>Regional level variation: 5-year arthroplasty revision rate, 3.2% - 9.2%. Average 5.2%³</td>
</tr>
<tr>
<td>Resource use</td>
<td>Length of hospital stay for TKA, 2.6 (Privathospitaler) - 4.0 (Nordjylland). Average 3.3 days⁴</td>
</tr>
</tbody>
</table>

Large potential in terms of disease burden and there are indications of variation in outcomes

- Relatively frequent surgical procedure in osteoarthritis
- Large variation observed in implant revision and readmissions (both of which reflect health outcomes but are also strongly linked to resource use)
- Relatively large variation in length of stay

Sources:
1 Team analysis based on Dansk Kvalitetsdatabase Knæalloplastikregister, årsrapport 2014 and Öppna jämförelser 2013 (Sveriges Kommuner och Landsting)
2 Team analysis based on Schmidt A, Husberg M och Bernftors L. Samhällsekonomiska kostnader för reumatiska sjukdomar 2003
3 Dansk Kvalitetsdatabase Knæalloplastikregister, årsrapport 2014
4 Team analysis based on LPR
# Assessment of knee replacement: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>X</td>
</tr>
<tr>
<td>Municipal care</td>
<td>X</td>
</tr>
</tbody>
</table>

- **M=Missing**
- **Regional and national level**
- **Regional level**
- **National level**

### Measures type

<table>
<thead>
<tr>
<th>Information source types</th>
<th>Example of relevant data missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adm. Care db(^1)</td>
<td>X(^7)</td>
</tr>
<tr>
<td>Qual. reg db(^2)</td>
<td>-</td>
</tr>
<tr>
<td>Cost db(^3)</td>
<td>-</td>
</tr>
<tr>
<td>Drug db(^4)</td>
<td>-</td>
</tr>
<tr>
<td>Diagnostic db(^5)</td>
<td>-</td>
</tr>
<tr>
<td>Municipal care db(^6)</td>
<td>X(^10)</td>
</tr>
<tr>
<td>Causes of death db(^7)</td>
<td>-</td>
</tr>
<tr>
<td>Social insurance db(^8)</td>
<td>-</td>
</tr>
<tr>
<td>Socio-demographic db(^9)</td>
<td>-</td>
</tr>
</tbody>
</table>

### Patient characteristics

- **Sociodemographic information**: X\(^7\)

### Health profile

- **Comorbidities**: X\(^12\)
- **Other clinically relevant characteristics**: X\(^13\)

### Care process

- **Treatment process**: X\(^16\)
- **Time**: X\(^17\)
- **Resource use/costs**: X\(^18\)
- **PREMs**: X\(^19\)

### Health outcome indicators

- **Short and long term outcomes**: X\(^19\)
- **Objective outcomes**: X\(^20\)
- **PROMs**: X\(^21\)

### Health outcomes (patient relevant)

- **Process of recovery**: X\(^22\)

### Information sources:

1. PAS/Landspatientregistret (LPR)
2. Dansk Fedmekirurgiregister, Årsrapport 2013
3. Omkostningsdatabasen
4. Danske reseptdatabaser eller Lægemiddelstatistikregisteret
5. KØS
6. Dødsårsagsregistret (only date of death at regional level)
7. DREAM
8. Various databases at Statistics Denmark

### Examples of existing potentially relevant variables

- **Age, sex**
- **Comorbidity index**
- **Additional comorbidities**
- **Anti-depressants**
- **Bilateral operation**
- **Preoperative knee score**
- **Operation method, procedure specifics**
- **Resources and costs related to initial hospital stay, readmissions and revisits**
- **Return to employment**
- **Implant survival, implant revisions, readmissions for different causes**
- **Orthopedic and non-orthopedic complications**
- **Blood transfusions**
- **Antibiotics**

### Low organizational complexity

- **Excellent data availability**
  - Available data is suitable for value based steering
  - PROMs are missing and should be considered to be collected

---

18 maj 2015
Assessment of multiple sclerosis: Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burden of disease</td>
<td></td>
</tr>
<tr>
<td>Prevalence</td>
<td>220 per 100,000 (^1)</td>
</tr>
<tr>
<td>Incidence</td>
<td>8 per 100,000 (^1)</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>Direct costs</td>
<td>1.4 billion DKK (^1)</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>400 million DKK (^2)</td>
</tr>
<tr>
<td>Identified variation</td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td>Share of patients under first-line treatment and working full-time at start of treatment that are no longer working full-time at the end of treatment or at the end of 5-year follow-up varies between 20% (Rigshospitalet) and 90% (Herlev) (^1)</td>
</tr>
<tr>
<td></td>
<td>Share of patients, treated with biological drugs, with improved or stationary level of pain varies between 87% (Rigshospitalet) and 100% (Fredericia) (^3)</td>
</tr>
<tr>
<td></td>
<td>Share of patients, treated with biological drugs, with improved or stationary level of fatigue varies between 67% (Fredericia) and 93% (Svendborg) (^1)</td>
</tr>
<tr>
<td>Care process</td>
<td>Average control frequency of JC virus antibodies in immunosuppressed patients varies between 1.2 (Odense) and 2.7 (Sønderborg) (^1)</td>
</tr>
<tr>
<td></td>
<td>Share of patients that received annual MRI scan while in treatment varies between 25% (Roskilde) and 93% (Sønderborg) (^1)</td>
</tr>
<tr>
<td></td>
<td>Share of patients assessed for anti-medicine antibodies after 3, 6 and 12 months of treatment varies between 17% (Odense) and 89% (Holstebro) (^1)</td>
</tr>
<tr>
<td></td>
<td>Share of patients assessed using EDSS score while in treatment varies between 51% (Odense) and 99% (Sønderborg) (^1)</td>
</tr>
</tbody>
</table>

Large potential in terms of disease burden and there are indications of variation in outcomes

- High direct costs of care, where pharmaceutical costs constitute a relatively large proportion
- Large variation observed in terms of both outcomes and care process

Sources:

1 Sclerosebehandlingsregistret
**Assessment of multiple sclerosis: Complexity in implementation**

### Organizational level

<table>
<thead>
<tr>
<th>Organizational complexity</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>[X]</td>
</tr>
<tr>
<td>Municipal care</td>
<td>X</td>
</tr>
</tbody>
</table>

M=Missing  
Regional and national level  
Regional level  
National level

### Information source types

- Adm. Care db
- Qual. reg
- Cost db
- Drug db
- Diagnostic db
- Municipal care db
- Causes of death db
- Social insurance db
- Socio-demographic db

### Example of relevant data missing

- X
- X
- X
- X
- X
- X
- X
- X
- X

### Measures type

- **Patient characteristics**
  - Sociodemographic information
  - Health profile
  - Other clinically relevant characteristics

- **Care process**
  - Treatment process
  - Resource use/costs
  - Patient experience and satisfaction (PROMs)

- **Health outcome indicators**
  - Mortality
  - Objective outcomes
  - Complications
  - Time to recovery

### Data availability

- **Patient characteristics**
  - Sociodemographic information: X
  - Health profile: X
  - Other clinically relevant characteristics: X

- **Care process**
  - Treatment process: X
  - Resource use/costs: X
  - Patient experience and satisfaction (PROMs): X

- **Health outcome indicators**
  - Mortality: X
  - Objective outcomes: X
  - Complications: X
  - Time to recovery: X

### Information sources:

1. PAS/Landspatientregistret (LPR)
2. Sclerosebehandlingsregistret
3. Omkostningsdatabasen
4. Dansk receptdatabase or Lægemiddelstatistikregisteret
5. KØS
6. Dødsårsagsregistret (only date of death at national level)
7. DREAM
8. Various databases at Statistics Denmark

### Examples of existing potentially relevant variables

- Age
- History of sick leave
- Educational level, civil status, country of birth
- Comorbidity Index
- Charlson Comorbidity Index
- Drug use reflecting comorbidities
- Proxy for disease duration
- Number of visits in special outpatient care
- Frequency of assessment for JC-virus in immunosuppressed patients
- Frequency of assessment for anti-medication antibodies
- Yearly MRI assessment
- Frequency of EDSS score in immunomodulated patients
- MRI scanning before start of treatment
- Blood test workup before start of treatment
- Use of disease-modifying drugs
- Resource-use and costs mainly tied to the MS disease and related complications
- Change in EDSS-score over time
- Fraction of patients working full time despite disease
- Inpatient and outpatient care related to relevant complications (diagnoses and procedures)

### Medium organizational complexity

- Available data covers many aspects of value based steering
- Lack of municipal data at regional level a slight limitation
- PROMs missing

---

**Good data availability**

- Available data covers many aspects of value based steering
- Lack of municipal data at regional level a slight limitation
- PROMs missing
Assessment of obesity (bariatric surgery): Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burden of disease</strong></td>
<td></td>
</tr>
<tr>
<td>Epidemiological measures</td>
<td></td>
</tr>
<tr>
<td>Prevalence</td>
<td>7200 per 100 000 (BMI &gt;30)$^1$</td>
</tr>
<tr>
<td>Incidence</td>
<td>17 bariatric procedures per 100 000$^3$</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>Direct costs</td>
<td>1.1 billion DKK (BMI&gt;30)$^1$</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>1.4 billion DKK (BMI&gt;30)$^1$</td>
</tr>
<tr>
<td><strong>Identified variation</strong></td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td>Improvements (yes or no) in HRQoL (Moorehead) varies between 84 % (Sydvestjysk) and 100 % (Aalborg, OUH Svendborg)$^3$</td>
<td></td>
</tr>
<tr>
<td>Excess body mass index loss more than 50 % in 1 year varies between 85 % (Sydvestjysk) and 96 % (Aalborg)$^3$</td>
<td></td>
</tr>
<tr>
<td>Readmission frequency in 30 days varies between 2 % (Privathospitalen) and 14 % (Viborg)$^3$</td>
<td></td>
</tr>
<tr>
<td>Early revision surgery (within 30 days) varies between 0 % (Privathospital Hamlet) and 8 % (Aalborg)$^3$</td>
<td></td>
</tr>
<tr>
<td>Late revision surgery (30 - 365 days) varies between 7 % Aalborg) and 22 % (Sydvestjysk)$^3$</td>
<td></td>
</tr>
</tbody>
</table>

Small potential in terms of number patients/procedures but variation in outcomes and resource indicate large potential for quality improvements

- Obesity is associated with a very large disease burden, but surgery may only impact the burden in a small subpopulation
- Large variation in outcomes (weight-loss and HRQoL)
- Large variation in complications and related costs

Sources:

3 Dansk Fedmekirurgiregister, Årsrapport 2013
## Assessment of obesity (bariatric surgery): Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational complexity</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measures type</th>
<th>Information source types</th>
<th>Example of relevant data missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient characteristics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sociodemographic information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health profile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td>X² X³ X⁴ X⁵ X⁶ X⁷ X⁸ X⁹ X¹⁰ X¹¹</td>
<td></td>
</tr>
<tr>
<td>Other clinically relevant characteristics</td>
<td>X² X³ X⁴ X⁵ X⁶ X⁷ X⁸ X⁹ X¹⁰ X¹¹</td>
<td></td>
</tr>
<tr>
<td>Treatment process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>M</td>
<td>Time to first visit, time to decision/surgery</td>
</tr>
<tr>
<td>Resource use/costs</td>
<td>X² X³ X⁴ X⁵ X⁶ X⁷ X⁸ X⁹ X¹⁰ X¹¹</td>
<td>PREMs</td>
</tr>
<tr>
<td>Health outcome indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health outcomes (patient relevant)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short and long term outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objective outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROMs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>X² X³ X⁴ X⁵ X⁶ X⁷ X⁸ X⁹ X¹⁰ X¹¹</td>
<td></td>
</tr>
<tr>
<td>Time to recovery</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Information sources:
1. PAS/Landspatientregistret (LPR)
2. Dansk Fedmeikurirurgregister, Årsrapport 2013
3. Omkostningsdatabasen
4. Dansk receptdatabase or Lægemiddelstatistikregisteret
5. KØS 6. Dødsårssageregisteret (only date of death at regional level)
6. DREAM 8. Various databases at Statistics Denmark

### Examples of existing potentially relevant variables:
Assessment of prostate cancer: Potential

<table>
<thead>
<tr>
<th>Burden of disease</th>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidemiological measures</td>
<td>Prevalence</td>
<td>138 per 100,000(^1)</td>
</tr>
<tr>
<td></td>
<td>Incidence</td>
<td>500 million DKK(^2)</td>
</tr>
<tr>
<td>Costs</td>
<td>Direct costs</td>
<td>300 million DKK(^2)</td>
</tr>
<tr>
<td></td>
<td>Indirect costs</td>
<td>300 million DKK(^2)</td>
</tr>
</tbody>
</table>

| Identified variation | Outcomes | Share of procedures with positive surgical margin (potential non-curative surgery with residual tumor tissue) for pT2 staged tumors varies between 0% (Hospitalenheden Vest) and 19% (Aalborg) and for pT3 staged tumors, variation spans from 0% (Hospitalenheden Vest) and 77% (Aarhus)\(^3\) |
| | Share of patients with urethral stricture complications within 1 year varies between 1% (Aalborg) and 7% (Hospitalenheden Vest)\(^3\) |
| | Care process | Share of patients receiving blood transfusion within 30 days varies between 2% (Herley) and 7% (Aalborg)\(^3\) |
| | | Share of patients receiving nerve preserving surgical procedures varies between 82% (Rigshospitalet) and 46% (Aalborg)\(^3\) |

Relatively high potential in terms of disease burden. Indication of certain variation across hospitals.

- The most common cancer type in men
- Variability between providers observed for both outcomes and care process

Sources:

3. Dansk Prostata Cancer Database
Assessment of prostate cancer: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td>(X)</td>
</tr>
<tr>
<td>Municipal care</td>
<td>(X)</td>
</tr>
<tr>
<td></td>
<td>M=Missing</td>
</tr>
</tbody>
</table>

**Medium organizational complexity**

**Excellent data availability**
- Available data covers many aspects of value based steering
- Lack of municipal data at regional level a slight limitation
- PROMs missing

**Data availability**

<table>
<thead>
<tr>
<th>Measures type</th>
<th>Information source types</th>
<th>Example of relevant data missing</th>
</tr>
</thead>
</table>
|                | Adm. Care db\(^1\) Qual reg db\(^2\) Cost db\(^3\) Drug db\(^4\) Diagnostics db\(^5\) Regional care db\(^6\) Outcomes of death db\(^7\) Social insurance db\(^8\) Demographic db\(^9\) |%
| Patient characteristics | x\(^\ast\) | - | - | - | - | - | X\(^{10}\) | X\(^{11}\) |%
| Health profile | Comorbidities Other clinically relevant characteristics | x\(^{12}\) | - | - | - | - | X | - | - |%
| Care process | Treatment process | x\(^{13}\) | x\(^{14}\) | - | - | x\(^{15}\) | X | X | - | - |%
| Resource use/costs | x\(^{16}\) | x\(^{17}\) | - | - | x\(^{18}\) | X | X | - | - |%
| PREMs | x\(^{19}\) | M | - | - | X | - | - | - |%
| Health outcome indicators | Mortality | - | x\(^{20}\) | - | - | X | - | - | - |%
| Health outcomes (patient relevant) | Objective outcomes | - | x\(^{21}\) | - | - | - | - | - | - |%
| | PROMs | - | M | - | - | - | - | - | - |%
| | Process of recovery | Complications | x\(^{22}\) | x\(^{23}\) | - | - | - | - | X |%
| | Time to recovery | - | - | - | - | - | - | - | - |%

**Examples of existing potentially relevant variables**
- Age
- History of sick leave
- Educational level, civil status, country of birth
- Comorbidity Index, Charlson Comorbidity Index
- Drug usage reflecting comorbidities
- Skeletal metastases
- PSA, TNM, prostate volume
- Number of visits in specialised outpatient care, surgical activities
- Share of patients receiving adjuvant endocrine therapy, Share of total prostatectomies using nerve preserving technique
- Use of relevant drugs such as endocrine treatment, bisphosphonates and chemotherapy
- Share of patients with radical excision
- 30-day mortality
- Share of patients with recurring cancer in 5 years
- ER-visits related to disease
- Frequency of blood transfusions, Share of patients with urethral stricture 1 year after surgery
- Related mainly to treatment process and complications

**Information sources:**
1 PAS/Landspatientregistret (LPR)
2 Dansk Prostate Cancer Database
3 Omkostningsdatabasen
4 Dansk receptdatabase of Lægemiddelstatistikregisteret
5 KØS Dødsårsagsregistret (only date of death at regional level)
6 DREAM Various databases at Statistics Denmark
Assessment of rheumatoid arthritis: Potential

<table>
<thead>
<tr>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Burden of disease</strong></td>
<td></td>
</tr>
<tr>
<td>Prevalence</td>
<td>750 per 100,000&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Incidence</td>
<td>31 per 100,000&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Costs</strong></td>
<td></td>
</tr>
<tr>
<td>Direct costs</td>
<td>1.1 billion DKK&lt;sup&gt;1,3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Indirect costs</td>
<td>1.5 billion DKK&lt;sup&gt;1,3&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Identified variation</strong></td>
<td></td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
</tr>
<tr>
<td>Share of patients, treated with biological drugs, with low disease activity varies between 55% (Rønne) and 88% (Kolding)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of patients, treated with biological drugs, with improved or stationary level of functionality varies between 64% (Holbæk) and 100% (Frederica)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of patients, treated with biological drugs, with improved or stationary level of pain varies between 87% (Rigshospitalet) and 100% (Frederica)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Share of patients, treated with biological drugs, with improved or stationary level of fatigue varies between 67% (Fredericia) and 93% (Svendborg)&lt;sup&gt;4&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

Large potential in terms of disease burden and there are indications of variation in outcomes

- High direct costs of care, where pharmaceutical costs constitute a relatively large proportion
- Certain variation observed in terms of outcomes among patients receiving biologicals

Sources:

4 Dansk Reumatologisk Database
Assessment of rheumatoid arthritis: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
</tr>
<tr>
<td>Primary care</td>
<td></td>
</tr>
<tr>
<td>Municipal care</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measures type</th>
<th>Information source types</th>
<th>Example of relevant data missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociodemographic info.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Comorbidities</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Other clinically relevant characteristics</td>
<td>X, X</td>
<td>Disease duration</td>
</tr>
<tr>
<td>Treatment process</td>
<td>X, X</td>
<td>Time to treatment</td>
</tr>
<tr>
<td>Mortality</td>
<td>X</td>
<td>PREMs</td>
</tr>
<tr>
<td>Complications</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Mortality</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Short and long term outcomes</td>
<td>X, X</td>
<td>Time in remission (DAS &lt;2.6)</td>
</tr>
<tr>
<td>Mortality</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Complications</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Information sources:
1 PAS/Landspatientregistret (LPR)
2 Dansk Reumatologisk Database
3 Omkostningsdatabasen
4 Dansk receptdatabase or Lægemiddelstatistikregisteret
5 KØS
6 Dødsårssagsregistret (only date of death at regional level)
7 DREAM
8 Various databases at Statistics Denmark

Examples of existing potentially relevant variables:
9 Age
10 History of sick leave
11 Educational level, civil status, country of birth
12 Diabetes, Elixhauser Comorbidity Index, Charlson Comorbidity Index
13 Antidiabetics
14 Proxy for disease duration
15 Specialised healthcare contacts
16 Types of drugs used: biological DMARDs: anti-TNFs (infliximab, etanercept, adalimumab etc) or other, non-biological DMARDs (Methotrexate)
17 Resource-use and costs mainly tied to the RA disease
18 Share of patients with low disease activity (DAS28 score), Share of patients with improved or stationary level of function (HAQ score), Share of patients with improved or stationary quality of life (VAS global scale), Share of patients with decreased or stationary levels of pain (VAS pain), Share of patients with decreased or stationary fatigue (VAS fatigue)
19 CRP-component of DAS-28
20 ER-visits due to drug-induced infections

Medium organisational complexity

- Available data covers many aspects of value based steering
- Lack of municipal data at regional level a certain limitation

Excellent data availability

- M=Missing
- Regional and national level
- Regional level
- National level
Assessment of stroke: Potential

<table>
<thead>
<tr>
<th>Burden of disease</th>
<th>Information type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epidemiological measures</td>
<td>Prevalence</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td>Incidence</td>
<td>612 per 100000</td>
</tr>
<tr>
<td>Costs</td>
<td>Direct costs</td>
<td>1.8 billion DKK</td>
</tr>
<tr>
<td></td>
<td>Indirect costs</td>
<td>560 million DKK</td>
</tr>
<tr>
<td>Identified variation</td>
<td>Outcomes</td>
<td>30 day mortality varies between 6 % (Amager) and 55 % (HE Midt)</td>
</tr>
<tr>
<td></td>
<td>Resource use</td>
<td>Share of patients being readmitted in 30 days varies between 0 % (Dronninglund) and 22 % (Amager)</td>
</tr>
<tr>
<td></td>
<td>Care process</td>
<td>Share of patients receiving thrombolysis in 1 hour varies between 50 % (Aalborg, Bornholm) and 100 % (Roskilde)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Share of patients with CVL offered carotid endarterectomy in 14 days varies between 27 % (Holstebro) and 100 % (Vejle, Nordsjælland)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Share of patients with atrial flutter and CVL, offered anticoagulants varies between 67 % (Sydestjysk) and 100 % (Vejle)</td>
</tr>
</tbody>
</table>

Large disease burden and variability in mortality indicate large potential impact from improved health care delivery.

• Notable differences in 30 day mortality across providers
• Readmittance rates and care process indicators also differed between providers

Sources:
3 Dansk Apopleksiregister
Assessment of stroke: Complexity in implementation

<table>
<thead>
<tr>
<th>Organizational level</th>
<th>Integrated part of the care episode</th>
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<tbody>
<tr>
<td>Specialized care</td>
<td>X</td>
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<tr>
<td>Primary care</td>
<td>(X)</td>
</tr>
<tr>
<td>Municipal care</td>
<td>X</td>
</tr>
</tbody>
</table>

M=Missing  [ ] Regional and national level  [ ] Regional level  [ ] National level

### Data availability

**Patient characteristics**

- Health profile
  - Comorbidities
  - Other clinically relevant characteristics

**Care process**

- Treatment process
  - Time
  - Resource use/costs
    - PREMs

**Health outcome indicators**

**Health outcomes (patient relevant)**

- Short and long term outcomes
  - Mortality
  - Objective outcomes
    - PROMs

- Process of recovery
  - Complications
  - Time to recovery

### Information source types

1. Admission care database
2. Qual. reg.
3. Cost db
4. Drug db
5. Diagnostic db
6. Municipal care db
7. Causes of death db
8. Social insurance db
9. Socio-demographic db

Example of relevant data missing

- Assessment of stroke severity; consciousness at arrival
- Average time until thrombolysis

### Examples of existing potentially relevant variables

9. Age, sex
10. Stroke type, Charlson/Elixhauser comorbidities
11. History of sick leave
12. Length of stay
13. Time until hospital admission
14. Alcohol, smoking
15. Length of hospital stay
16. Time until hospital admission
17. Use of municipal nursing home care
18. Resources and costs related to initial hospital stay
19. Return to employment
20. 30 day mortality in cerebrovascular lesion
21. Relapse/reoccurring stroke
22. Major bleeding after thrombolysis
23. DVT/PE, fracture, UVI
24. Readmission in 30 days after cerebrovascular lesion

### Information sources:

1. PAS/Landspatientsregistret (LPR)
2. Dansk Apoteksforsikring register
3. Omkostningsdatabasen
4. Dansk receptdatabase or Lægemiddelstatistikregisteret
5. KØS
6. Dødsårssagrregister (only date of death at national level)
7. DREAM
8. Various databases at Statistics Denmark
Overview of Sveus and ICHOM “standard sets” for the 10 selected patient groups

<table>
<thead>
<tr>
<th>Available standard sets – deep-dives</th>
<th>Other available standard sets*</th>
<th>Other planned standard sets**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spine surgery</td>
<td>Dementia</td>
</tr>
<tr>
<td></td>
<td>Cleft lip and palate</td>
<td>Brain tumours</td>
</tr>
<tr>
<td></td>
<td>Depression and anxiety</td>
<td>Colon cancer</td>
</tr>
<tr>
<td></td>
<td>Macular degeneration</td>
<td>Inflammatory bowel disease</td>
</tr>
<tr>
<td></td>
<td>Lung cancer</td>
<td>Frail elderly</td>
</tr>
<tr>
<td></td>
<td>Coronary artery disease</td>
<td>Heart failure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cranofacial microsomia</td>
</tr>
<tr>
<td>Breast cancer</td>
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<tr>
<td>Childbirth</td>
<td></td>
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<tr>
<td>Diabetes</td>
<td></td>
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</tr>
<tr>
<td>Hip replacement</td>
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<td></td>
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<tr>
<td>Knee replacement</td>
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<td>Multiple sclerosis</td>
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<tr>
<td>Obesity surgery</td>
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<tr>
<td>Prostate cancer</td>
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<td></td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Developed in ICHOM or Sveus  ** Finalized or ongoing 2015
Content

• Background of feasibility study and case examples from Sweden

• Denmark starting point (organisational readiness and data landscape)

• High level assessment of potential for ten selected patient groups in Denmark

• Suggested roadmap for Denmark

• Appendix
  – Feasibility project governance
  – Synthesis of key stakeholder interviews
  – Danish healthcare data prerequisites for adopting value based steering and support models
  – Deep-dives: Assessment of potential and “ease of implementation” of new steering models for ten selected patient groups
    
    – Example analysis on Childbirth based on Danish data
Example of case-mix-adjusted benchmarking in Denmark: Childbirth analysis using Sveus’ definitions

- Childbirths were identified in LPR using ICD-10 codes O80-O84

- Births from 2012 and 2013 were included in the analysis
  - Data from 2011 to 2013 were used for analysis to capture history of comorbidities and complications

- Indicators analyzed
  - Process indicator: Rate of cesarean section
  - Health outcomes indicator: Rate of ruptures in vaginal births
  - Resource use indicator: Length of stay

- Case-mix-factors available for adjustment
  - Age, multiple birth, fetal position, comorbidities, complications during pregnancy

- Case-mix-factors not available for adjustment
  - Parity (first birth), prematurity, previous cesarean section, socioeconomic factors, BMI

- Results presented at clinic level but name of clinic anonymized
  - Clinics with less than 50 births were excluded

This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance within the health system.
Interpretation of statistical presentation

Predicted length of stay, given the provider’s case-mix

Provider’s actual length of stay

Provider’s deviation from other providers, adjusted for case-mix
Example of process measure:
Significant variations in cesarean sections

Total n=110 874

Rate of cesarean sections (%)

Deviation from other providers (log-odds ratio)

Clinic c17 has an observed CS rate at average but actually performs fewer CS than predicted, given their case-mix.

Clinic c19 has an observed CS rate below average but also has an easier case-mix.

Clinic c5 performs significantly more CS than the other clinics

• Significant variation in observed section rate across clinics, between 14% and 27% in observed rate
• Differences in predicted rates highlight differences in patient populations
• When controlling for case-mix, statistically significant differences between clinics remain

Note: Clinics with <50 births were excluded. Caesarian section identified using a combination of diagnosis codes (O82, O842) and procedure codes (MCA00, MCA10, MCA20, MCA30, MCA33, MCA96). Analysis adjusted for age, multiple birth, fetal position, comorbidities, complications during pregnancy; 1) This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance of the health system; Source: LPR
Example of an health outcome measure:
Significant variation in perineal tears (degree 3 and 4) in vaginal deliveries

Total n=86 399

Rate of perineal tears (%)

Deviation from other providers (log-odds ratio)

Clinic c19 has a tear rate below expected (significant difference)

Clinic c5 has a tear rate above expected (significant difference)

- Large variation in rupture rate across clinics
  - Between 2.1% and 5.9% in observed rate
  - After controlling for casemix, statistically significant differences between clinics remain
    - Important case-mix factors for ruptures such as first-birth and BMI are missing

Note: Clinics with <50 births were excluded. Degree 3 and 4 perineal ruptures were identified using diagnosis codes (O702, O703). Analysis adjusted for age, multiple birth, fetal position, comorbidities, complications during pregnancy; 1) This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance of the health system; Source: LPR
Example of resource indicator: Significant variation in length of stay

Total n=110,874

- Significant variation in observed length of stay across clinics
  - Maximum difference of 1.5 days between clinics
  - Statistically significant differences between clinics after controlling for case mix

Note: Clinics with <50 births were excluded. Length of stay calculated as uddtof-inndtof in LPR. Analysis adjusted for age, multiple birth, fetal position, comorbidities, complications during pregnancy; 1) This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance of the health system; Source: LPR
Possibly significant potential for improved outcomes and reduced costs

- Large variation observed in Danish childbirth care in indicators related to process measures, health outcomes and resource use

- Discussions with Danish obstetricians and midwives needed to validate findings and discuss potential underlying causes for differences

- Significant room for improved analyses by linking to additional data
  - Additional indicators (health outcomes and process measures from quality register) that are important from a value-based perspective
  - Enhancement of case mix-adjustment by adding important risk factors not available in LPR

This analysis has been presented to illustrate how existing Danish data can be used to support value-based steering and support only. Results need to be validated with childbirth experts before it can be used to draw conclusions on performance of the health system.