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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- **Background of feasibility study and case examples from Sweden**
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Starting point: The Danish health cares system is performing relatively well according to the OECD

EXAMPLES – NOT EXHAUSTIVE

- **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

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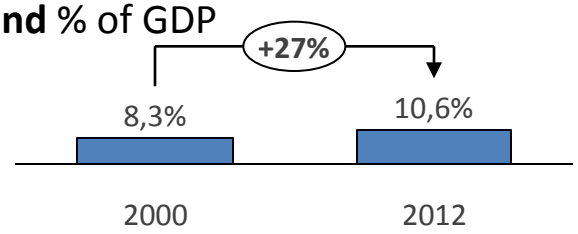
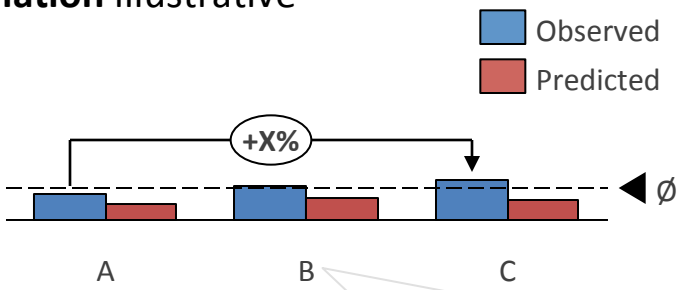
Overarching challenges (not exhaustive)	*Observations*
Costs for Healthcare growing faster than GDP	**HC spend** % of GDP
Unjustified variations in procedure methods, health outcomes and cost	**Variation** illustrative
Slow diffusion of 'best practices'	





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

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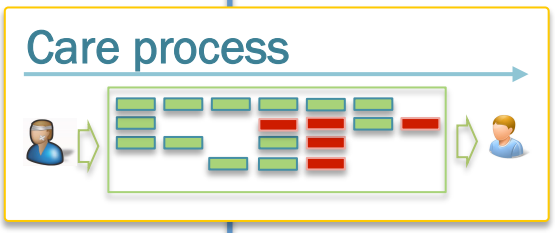

Typical challenges in OECD countries (not exhaustive)

- 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 todays 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

(not HBa1c level)

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

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

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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	..to patient value
Governance /steering	• Monitoring, target setting focused on **waiting times, cost and productivity**	• Monitoring and target setting focused on **waiting times, health outcomes and efficiency**
	• Reimbursement based on activities	• Reimbursement designed to support efficiency and innovation
Organization	• Healthcare organized around medical disciplines	• Healthcare organized around patients groups with similar needs

Examples of engaged organisations

KAROLINSKA Universitetssjukhuset

AKADEMISKA SJUKHUSET

HARVARD BUSINESS SCHOOL

OECD ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

SVEUS När hälsan vårdas

ICHOM

Requires new steering 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

När hälsan räknas

- *>50 organisations in Sweden working together in developing new monitoring and reimbursement models*
- *Represents ~70 % of Swedish population*

Region Skåne · Stockholms läns landsting · Landstinget Dalarna · Region Jämtland Härjedalen · Landstinget i Uppsala län · Västra Götalandsregionen · Region Östergötland

Sveus content

I. **In depth benchmarking**

II. **New monitoring systems** focusing on efficiency

III. **New reimbursement systems** that support efficiency

To support value based steering and support

Clinic

5. Reporting of results and performance dialogues on value

3. Plan and perform improvement projects

Continuous value improvement →

Management

6...n. Follow up on targets, set new targets with clinics

4. Provide development support to clinics

2. Set focus areas and value improvement targets with clinics

1. Enable monitoring of efficiency through new monitoring systems

Examples from Sweden, SVEUS: Sveus is organised in 12 projects with a national steering group – combining regional autonomy with the advantages of national collaboration

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Styrgrupp – 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)	9- Driftsättning
				10- Sociodem. / Sjuskrivning
2- Expertgrupp Rygg (SLL)	4- Expertgrupp Fetmakirurgi (VGR)	6- Expertgrupp Diabetes (Jämtland, Dalarna)	8- Expertgrupp Bröstcancer (Uppsala)	11- Övergång i förvaltning
				12- Vårdområdesanalys

Funktionella landstingsöverskridande expertgrupper

- Juridik & Informations-säkerhet
- Kommunikation
- Vårdinformatik
- Ersättningssystem

Lokala landstingsprojektgrupper

Övrig forskning

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

Could facilitate future detailed benchmarking between Sweden and Denmark[1]

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

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

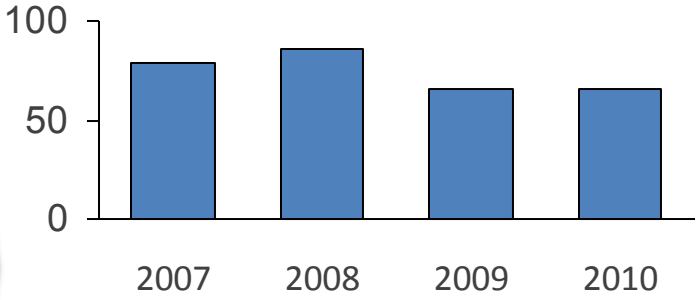
- Accreditation of providers and "patient free choice" of provider
- "Package price" for episode of care up to five years post surgery (Including "complication warranty")

Info on scope (so far):
- All providers
- ASA 1-2 patients

SVEUS develops next generation of bundle payment for THR/TKR

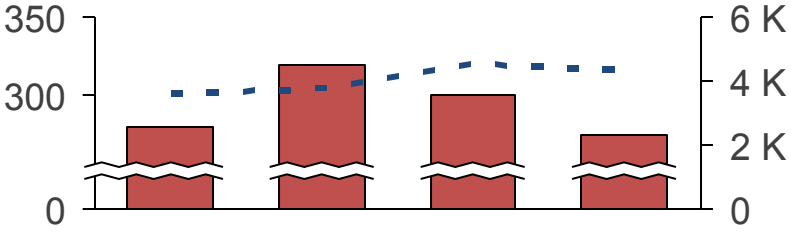
Experienced benefits

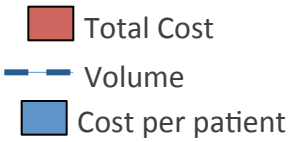
Cost per patient
SEK thousand



Total cost
SEK million

Volume
# of patients





- 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)

Examples from Sweden, payment models: Spine surgery bundle payment introduced in Stockholm county during 2013

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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

Info on scope (so far):
- Private providers
- All patients

SVEUS develops next generation of bundle payment for Spine

Experienced /Expected benefits

- Care providers take a more **proactive 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)

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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**

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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

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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'

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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

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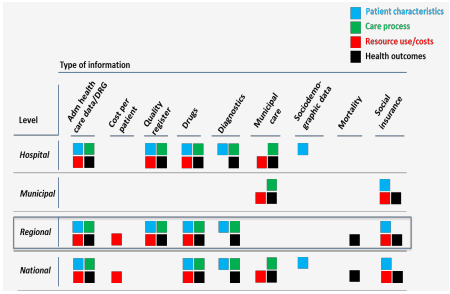
Data landscape and legal aspects: In-depth analysis of DK health care data landscape as well as legal aspects of using data for value based steering and support models show that DK has a good starting point

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

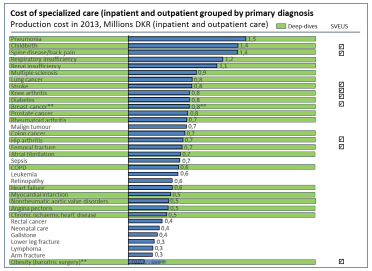
- Short-list derived based on
  - Complexity (e.g., organizational)
  - Data availability

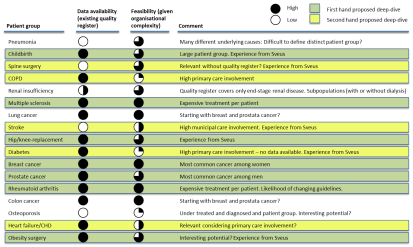
Deep-dives

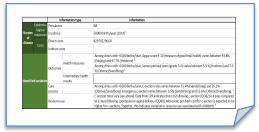
- For each short-listed medical condition, data is gathered to evaluate
  - potential impact (e.g., burden of disease & variation)
  - "ease of implementation"

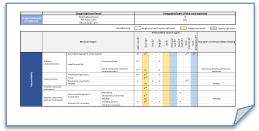
Deep-dives:

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









Note: more details available in appendix

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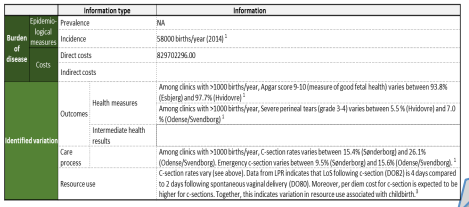
Deep-dives: For each medical condition, analysis has been performed to evaluate potential impact and ease of implementation (available in appendix)

Information gathered*

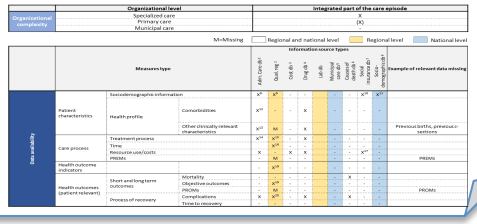
POTENTIAL IMPACT



			Information type	Information
Burden of disease	Epidemiological measures		Prevalence	NA
			Incidence	58000 births/year (2014) [1]
	Costs		Direct costs	829702296.00
			Indirect costs	
Identified variation	Outcomes	Health measures		Among clinics with >1000 births/year, Apgar score 9-10 (measure of good fetal health) varies between 93.8% (Esbjerg) and 97.7% (Hvidovre) [2] Among clinics with >1000 births/year, Severe perineal tears (grade 3-4) varies between 5.5 % (Hvidovre) and 7.0 % (Odense/Svendborg) [3]
		Intermediate health results		
	Care process			Among clinics with >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). [3] C-section rates vary (see above). 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. [4]
	Resource use			

- Incidence/prevalence
- Burden of disease
  - Direct costs
  - Indirect costs
- Indicators of variability (if/when available)

EASE OF IMPLEMENTATION



Organizational complexity	Specialized care Primary care Municipal care	Integrated part of the care episode X (X)

N=Missing | Regional and national level | Regional level | National level

	Measurers type			Information source types										Example of relevant data missing
Data availability	Patient characteristics	Socioedemographic information		X[1]	X[1]	-	-	-	-	-	-	X[1]	X[1]	
		Health profile	Comorbidities	X[1]	-	-	X	-	-	-	-	-	-	
			Other clinically relevant characteristics	X[1]	NA	-	X	-	-	-	-	-	-	Previous births, previous c-sections
	Care process	Treatment process		X[1]	X[1]	-	X	-	-	-	-	-	-	
		Time		-	X[1]	-	-	-	-	-	-	-	-	
		Resource use/costs		X	-	X	X	-	-	-	-	X[1]	-	
		PROMs		-	M	-	-	-	-	-	-	-	-	PROMs
	Health outcome indicators			-	X[1]	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-	-	-	-	-	-	X	-	-	
			Objective outcomes	-	X[1]	-	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	-	PROMs
			Complications	X	X[1]	-	X	-	-	-	X	-	-	
		Process of recovery	Time to recovery	-	-	-	-	-	-	-	-	-	-	

- Patient data availability
  - Sources
  - Content
  - Accessibility
- Complexity

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

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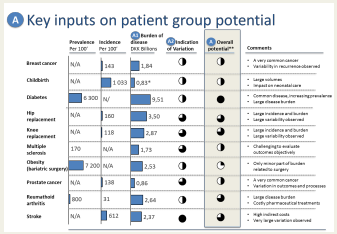
Synthesis of deep-dives: Improvement opportunity identified across selected patient groups, with likely highest short-term potential for groups that represent one-off procedures/ treatments

Approach (see appendix for details)

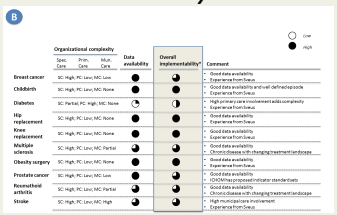
A *Summary of **potential** by disease area*

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

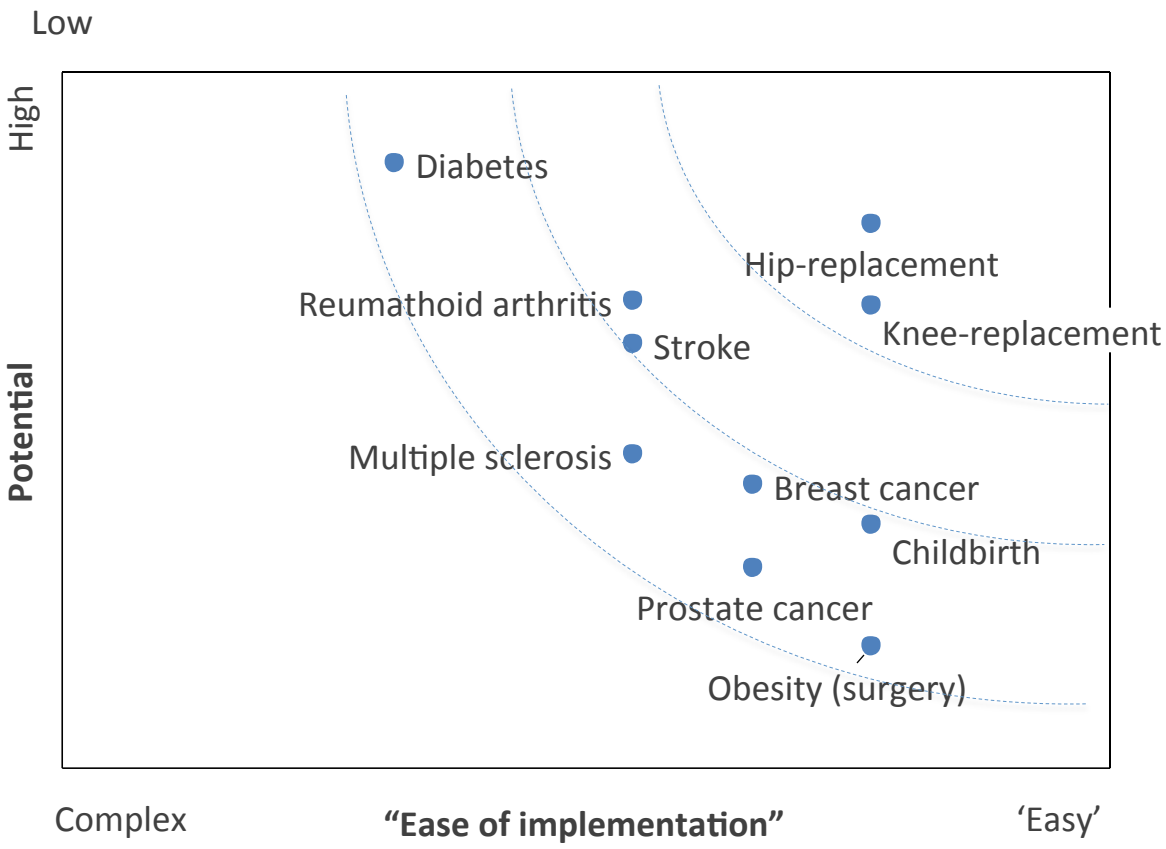


B *Synthesis **"Ease of implementation"***

- *Organizational complexity*
- *Data availability*



INDICATIVE



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

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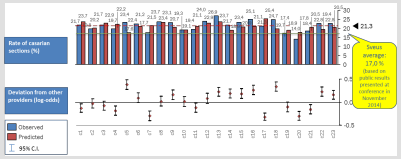
- EXAMPLES – NOT EXHAUSTIVE
- ILLUSTRATIVE ANALYS ONLY – NOT VALIDATED BY LOCAL EXPERTS

Approach (see appendix for details)

- 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



Comparison (type of indicator)	**Take-away**
Cesarean sections (treatment process)	• Significant variation in section rate across clinics (14% - 27% in observed rate) – significantly higher than Sweden • Significant differences after case-mix adjustment
Perineal tears (health outcome)	• Large variation in rate of perineal tears (2% - 6% in observed rate) • Significant differences after case-mix adjustment
Length of stay (resource use/cost)	• Significant variation in observed section rate across clinics (difference of up to 1,5 days) • Significant differences after case-mix adjustment

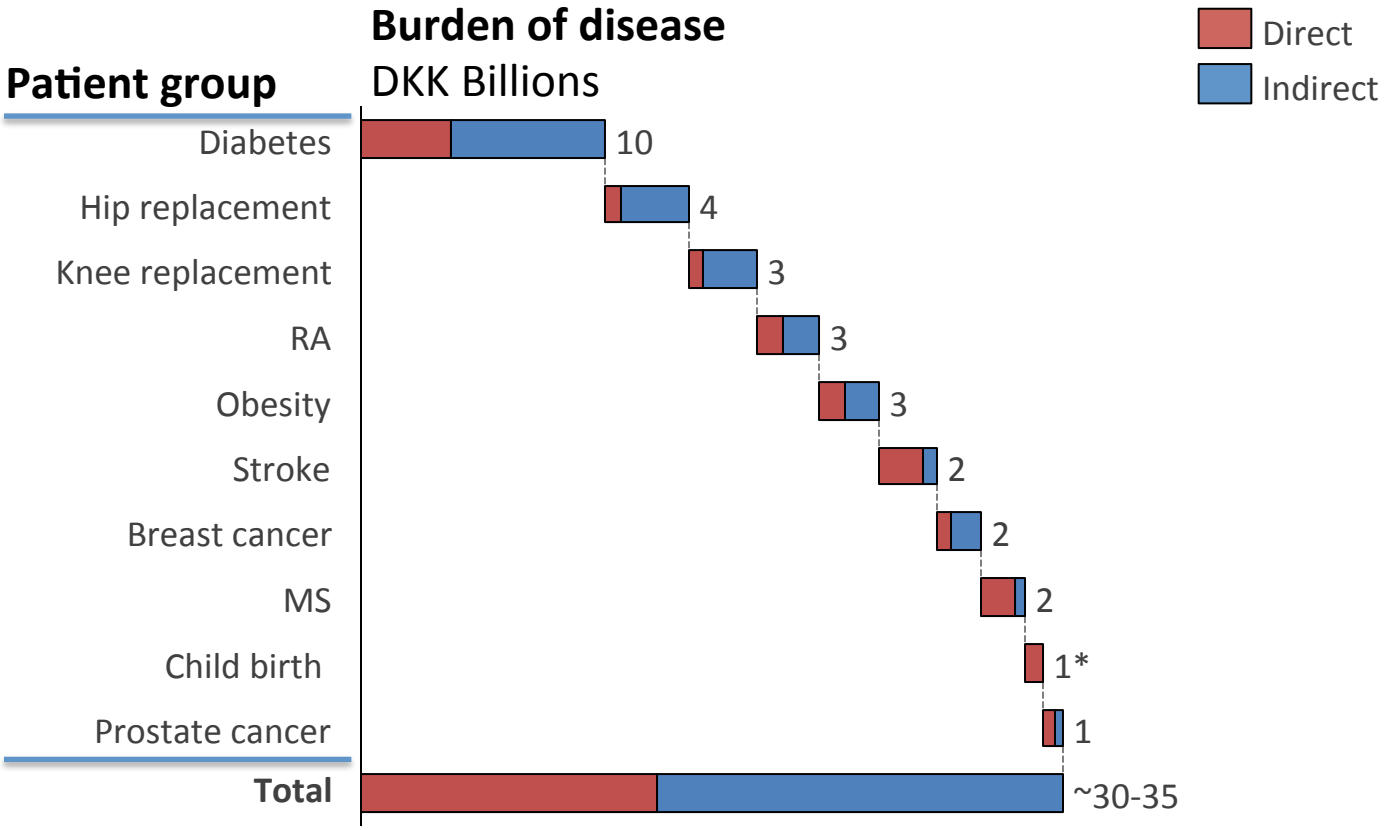
What is new about this

- Proof of concept that existing Danish data can be used for analysis
- Case mix adjusted analysis supports potential (e.g., "unjustified" variations)

* 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



* Excluding indirect costs, and costs of maternity care and neonatal care
Source: Desk research; team analysis
Note: details available in appendix

IVBAR

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- Appendix

Roadmap: Thought starter on high level roadmap for Denmark - Simplified

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FOR DISCUSSION

Step 0 : ***Set up initial systems***

- Set up first version of value based monitoring systems using existing Danish data, based on learnings from Sweden to create momentum and excitement

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

- **Conduct coordinated development (R&D) projects** for 10 selected patient groups[1]:
  - 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[2]
- **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 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

Sub-sequent steps/ pilot based on strategy of each region

General idea

	Patient groups				
	1	*2*	*3*	*4*	*5*
Region 1	*lead*	*participate*	*participate*	*participate*	*participate*
Region 2	*participate*	*lead*	*participate*	*participate*	*participate*
Region 3	*participate*	*participate*	*lead*	*participate*	*participate*
Region 4	*participate*	*participate*	*participate*	*lead*	*participate*
Region 5	*participate*	*participate*	*participate*	*participate*	*lead*

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	• 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
Combine regional autonomy with the advantage of national collaboration	• 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**
Engage all concerned stakeholders early	• 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
Show quick results	• 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
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Overview of project deliverables (per January 2015)

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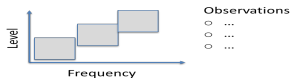
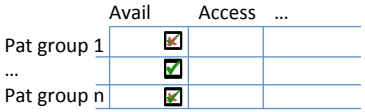
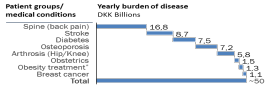
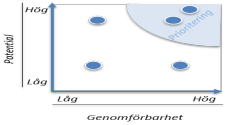
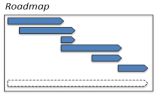
Purpose of study	*Deliverables*		Interviews	Desk research	Quantitative
1) Assess starting point and general prerequisites for Denmark to adopt value-based steering and support models	➢ High level diagnose of current governance model(s) based mainly on key stakeholder interviews		✓	✓	
	➢ Analysis of current patient data landscape and potential technical/legal constraints for enabling implementation of value based steering models		✓	✓	✓
2) Assess potential and 'implementability' through deep-dives in selected patient groups	➢ Analysis of availability/quality of relevant data (e.g. patient relevant outcome data and cost data)		✓	✓	
	➢ High level assessment of potential per patient group (e.g., variability in health outcomes and/or costs)				✓
3) Support Danish Regions to develop an action plan	➢ Proposed prioritization between patient groups to use for initial steering model pilots based on 1) potential for improved care and 2) complexity in implementation		✓		
	➢ High-level action plan		✓		

Approach (per January 2015)

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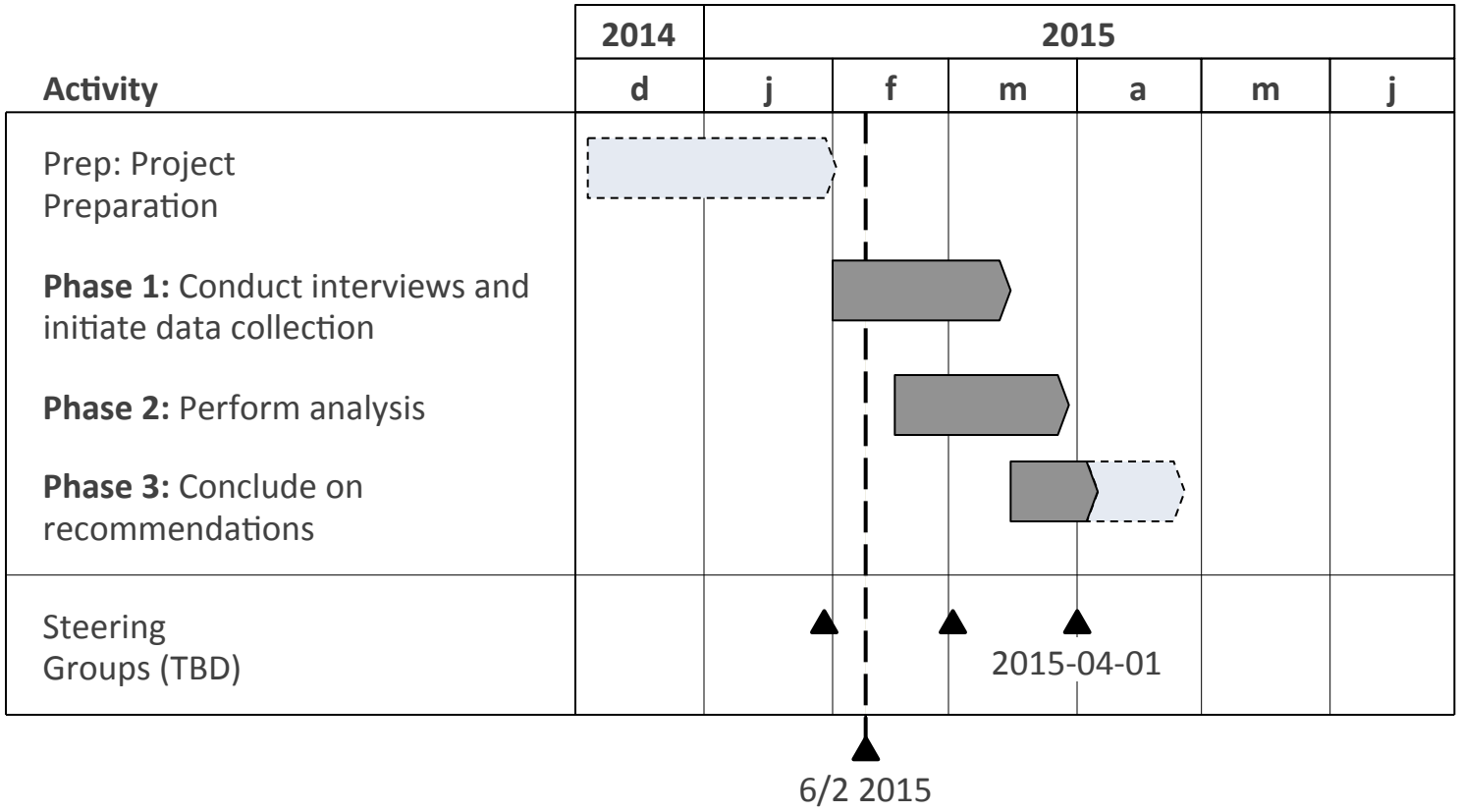
	Project Preparation	Phase 1: Conduct interviews and initiate data collection	Phase 2: Perform analysis	Phase 3: Conclude on recommendations
		~4-6 weeks	*~ 6-8 weeks*	*~ 2-3 weeks*
1) Assess starting point and general prerequisites for Denmark to adopt value-based steering and support models	• Set up 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	• 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)
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)	• Propose how to address each analysed patient group (e.g., monitoring and/or reimbursement system pilots)
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

Report/ Workshop (s)

Workplan and timing (per January 2015)



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)

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Key stakeholder interviews: ~40 key leaders and experts have been interviewed to evaluate DK starting point and future vision

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Name	***Organisation/Region***
Kristian Heunicke	Danske Regioner
Rikke Margrethe Friis	Danske Regioner
Ditte S. Sørensen	Danske Regioner
Casper H. Mikkelsen	Danske Regioner
Niels Würgler Hansen	Finansministeriet
Søren Varder	Finansministeriet
Paul Bartels	RKKP
Mads Hansen	Ministeriet for Sundhed og Forebyggelse
Charlotte Houggard	Ministeriet for Sundhed og Forebyggelse
Svend Særkjær	Ministeriet for Sundhed og Forebyggelse
Jens Ole Skov	Nordjylland
Jan Funder	Syddanmark
Torben Hedegaard Jensen/ Søren Helsted	Hovedstaden
Poul Erik Hansen	Statens Seruminstitut
Ole Thomsen/Mette Jensen	Midtjylland
Carsten Lind	Midtjylland
Poul Carstensen	Midtjylland
Morten Koch/Lene Jørndrup	Sjælland
Henrik Villadsen & Teis Andersen	Roskilde & Køge Sygehus
Kirsten Wisborg	Aarhus Universitetshospital
Tue Jensen	Rigshospitalet
Kasper Axel Nielsen	Foreningen af speciallæger
Morten Freil og Annette Wandel	Danske Patienter
Jes Søgaard	Kræftens Bekæmpelse
Jakob Kjellberg	Sundhedsøkonom, KORA
Katja Kayser	København Kommune
Per Stenberg Christensen/Eva Bartels	Region Hovedstaden
Helene Hedensted	Nordjylland
Marie Bussey Rask	Danske Regioner
Ann Vilhelmsen	Danske Regioner
Camilla Dürke Tybring	Danske Regioner

Emerging perspective on starting point in DK (1/2) - What works well

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

Emerging perspective on starting point in DK (2/2) - What could be improved

Hypothesis/early perspective	*Quotes*
Need to shift focus in steering models from productivity to efficiency	*'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'*
Increase focus on outcomes that are relevant for patients	*'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'*
Improve the health care systems access to data	*'Wee 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'* *''No one has ever died from combining data, however many persons has likely died because we haven't been able to connect the different data points'*
Improved collaboration between speciality care and primary care; Improved collaboration between regions and municipalities	*'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'*

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Broad overview of data landscape

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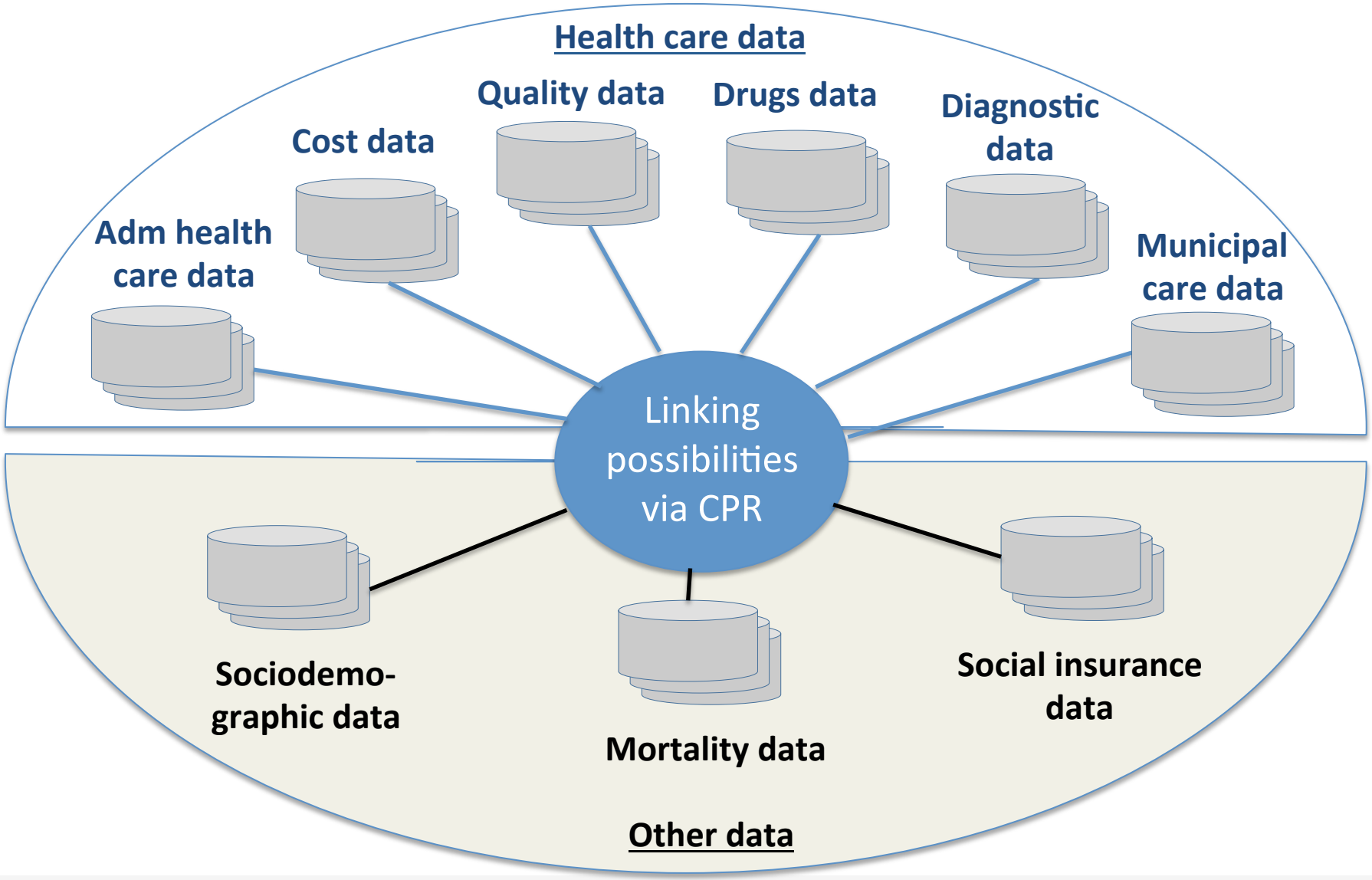
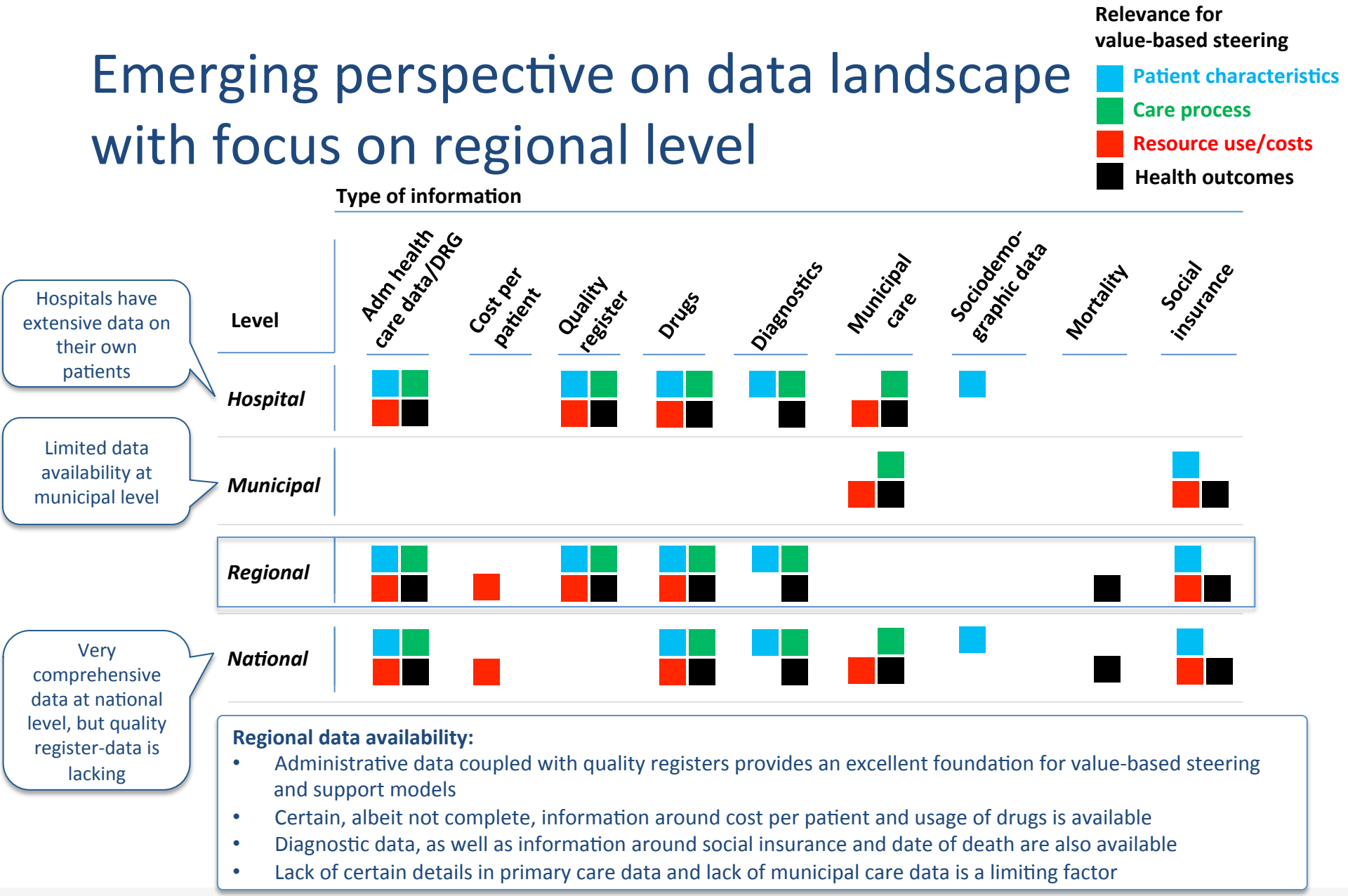


Emerging perspective on data landscape with focus on regional level



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

Regional level data

Patient characteristics

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

- 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

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

- 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

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

- 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

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Regional level data

Health outcomes

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

- 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

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National level data

Patient characteristics

Type of information	Data source	Examples
Clinical data	LPR	Comorbidities, age
	Lægemiddelstatistikregisteret	Use of anti-depressants
	Quality Registers not available*	Clinical characteristics, comorbidities
	DREAM	Sick-leave, early retirement
	Diagnostic databases	Cholesterol, HbA1c, x-rays
Socio-demographic data	Statistics Denmark's databases	Country of birth, educational level

- 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

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National level data

Care process

Type of information	Data source	Examples
Clinical data	LPR	Use of procedures, visits and admissions
	Lægemiddelstatistikregisteret	Use of pharmaceuticals
	Quality Registers not available*	Detailed clinical parameters, PREMs
	Diagnostic databases	Use of different diagnostics
	KØS	Use of rehabilitation, home care

- 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

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National level data

Resource use/costs

Type of information	Data source	Examples
Regional care activities and costs	LPR	Procedures, visits and admissions
	Omkostningsdatabasen	Estimated cost per patient
	Lægemiddelstatistikregisteret	Use and cost of pharmaceuticals
	Quality Registers not available*	Detailed clinical information on resource use
Social insurance data	DREAM	Sick-leave, early retirement
Municipal care data	KØS	Use of rehabilitation, home care

- 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 slightly less granular but provides more detail than DRG

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National level data

Health outcomes

Type of information	Data source	Examples
Mortality	Dødsårsagsregistret	Date of death
	LPR	Diagnosis codes for inpatient death
Morbidity	LPR	Complications
	DREAM	Return to work
	Quality Registers not available*	PROMs, detailed clinical outcomes
	Lægemiddelstatistikregisteret	Use of antidepressants, antibiotics
	Diagnostic databases	Change in cholesterol, blood pressure, HbA1c
	KØS	Need for rehabilitation, home care

- 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 Evaluatation of Marginalisation (Dansk Register for Evaluering af Marginalisering (DREAM))
- Diagnostics Databases (diagnose databaser)

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High level legal analysis (2/2)
- Legal questions and data sources/databases

Legal questions	*Conclusions from high level legal assessment**
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)	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.*
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	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.***

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

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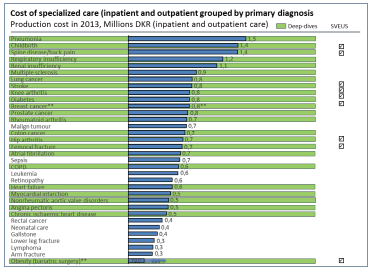
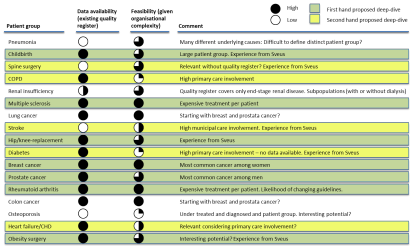
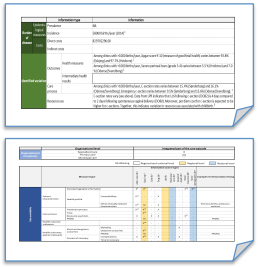
Process to select deep-dives

Long-list of patient groups → Short-list → Deep-dives

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

ROUGH ESTIMATES

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Long-list of patient groups for deep-dives

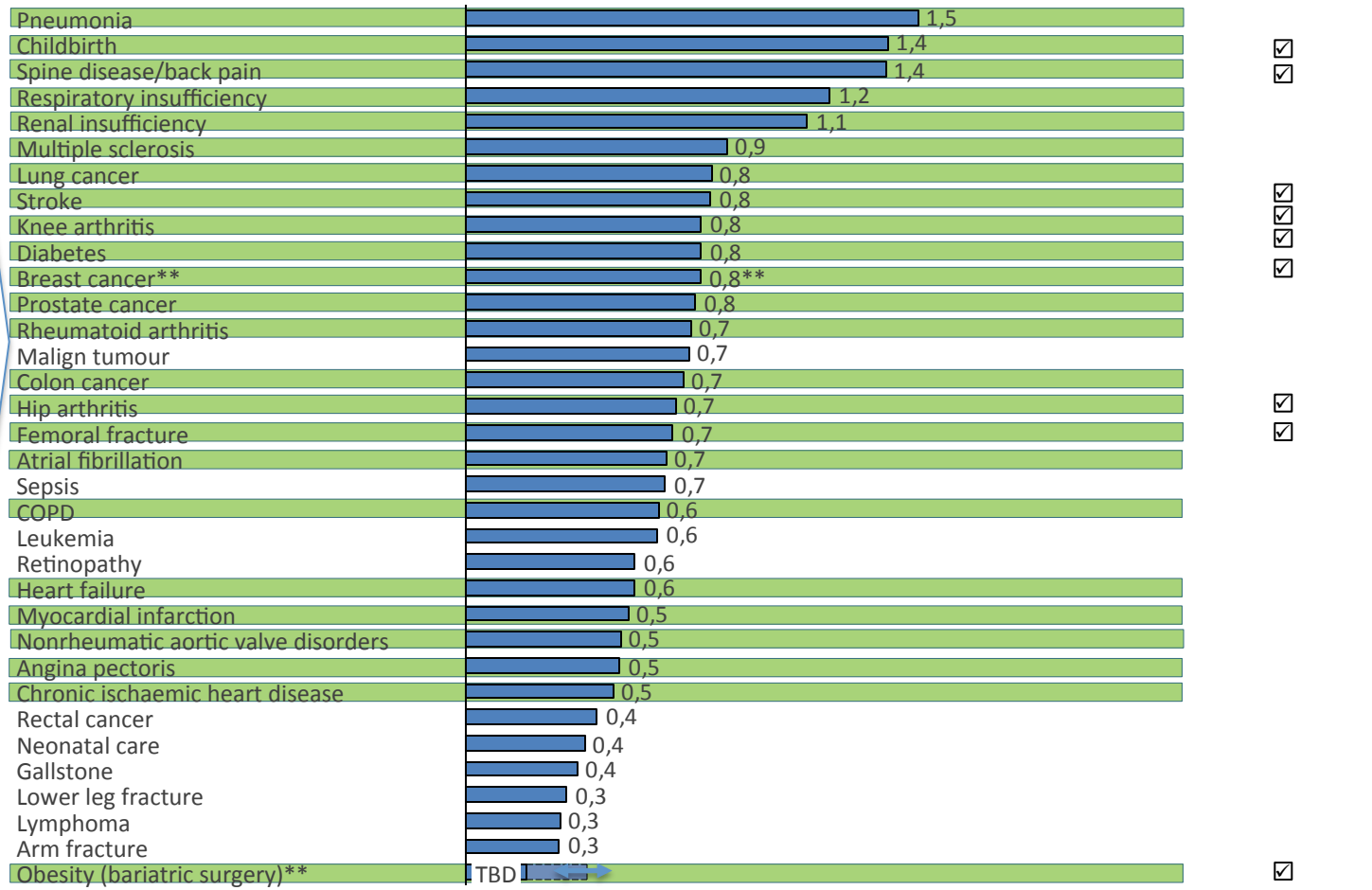
Long-list

Selected long list based on criteria:

- SVEUS patient groups
- Expert opinion
- Top 15 in ”Cost” (proxy for burden of disease)

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

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



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

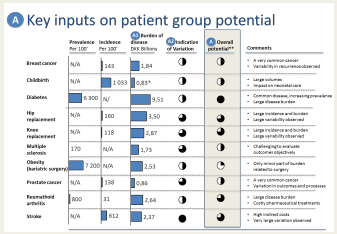
IVBAR

Deep-dives

Approach

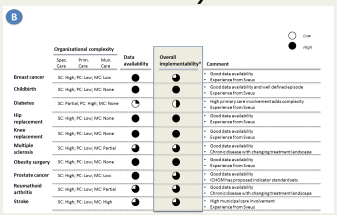
A *Summary of **potential** by disease area*

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

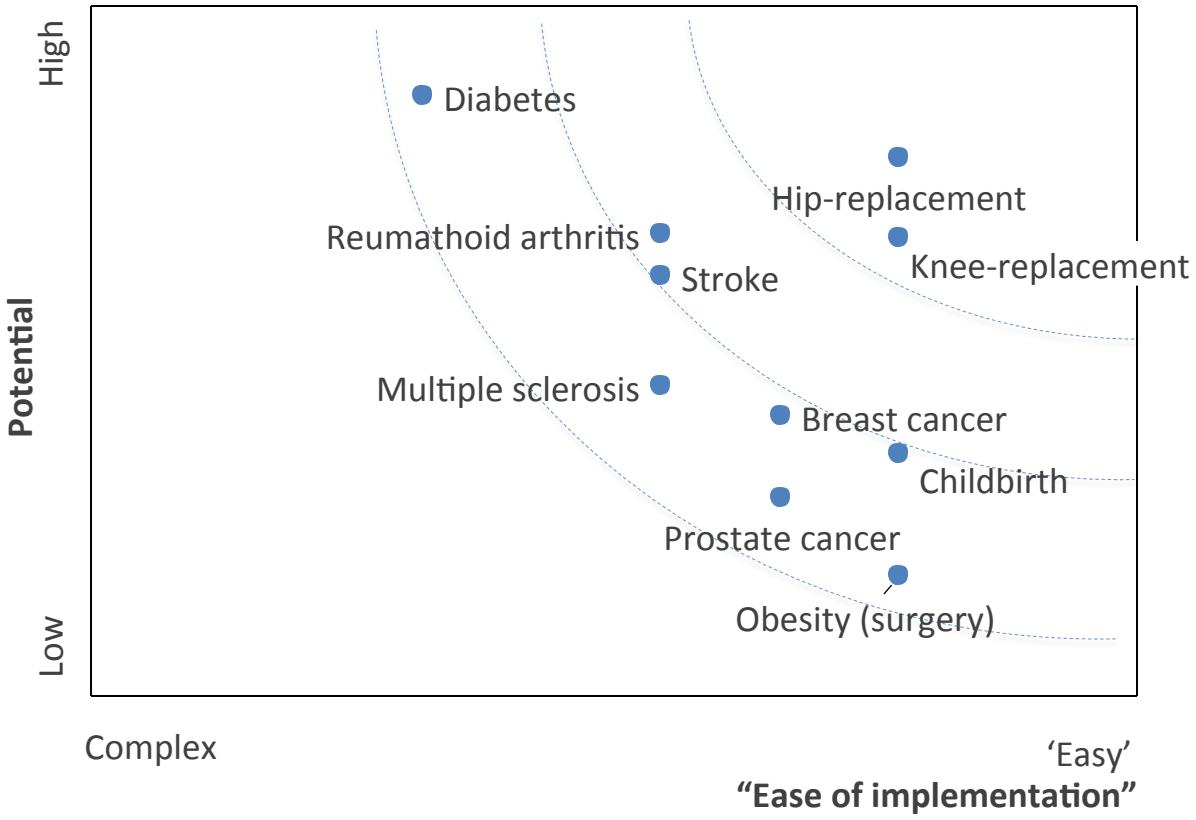


B *Synthesis **"Ease of implementation"***

- *Organizational complexity*
- *Data availability*



INDICATIVE



A Key inputs on patient group potential

Low ○ ● High

	Prevalence Per 100'	Incidence Per 100'	A1 Burden of disease DKK billion	A2 Indication of Variation	A Overall potential***	Comments
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

A2 Exemplary indicators on variation in outcomes/costs

Deep-dives IVBAR

○ Low ● High

Patient groups	Indication of variation	Examples of indicator variation (not exhaustive)*
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 recieving 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

B Key inputs on "ease of implementation"

○ Low ● High

	Organizational complexity			Data availability	Overall implementability*	Comment
	Spec. Care	Prim. Care	Mun. Care			
Breast cancer	High	Low	Low	●	◕	• Excellent data availability • Experience from Sveus
Childbirth	High	Low	-	●	●	• Excellent data availability and well defined episode • Experience from Sveus
Diabetes	Medium	High	-	◔	◑	• High primary care involvement adds complexity • Experience from Sveus
Hip replacement	High	Low	-	●	●	• Excellent data availability and well defined episode • Experience from Sveus
Knee replacement	High	Low	-	●	●	• Excellent data availability and well defined episode • Experience from Sveus
Multiple sclerosis	High	Low	Medium	◕	◕	• Good data availability • Certain primary care and municipal care involvement
Obesity surgery	High	Low	-	●	●	• Excellent data availability • Experience from Sveus
Prostate cancer	High	Low	Low	●	◕	• Excellent data availability • ICHOM has proposed indicator standard sets
Rheumatoid arthritis	High	Low	Medium	◕	◕	• Excellent data availability • Certain primary care and municipal care involvement
Stroke	High	Low	High	◑	◕	• High municipal care involvement • Experience from Sveus

* Based 50% on complexity and 50% on data availability

Assessment of potential impact in Childbirth

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	NA
		Incidence	1 033 per 100 000[1]
	Costs	Direct costs	830 million DKK[2]
		Indirect costs	
Identified variation		Outcomes	Among clinics with >1000 births/year, Apgar score 9-10 (measure of good foetal health) varies between 93.8% (Esbjerg) and 97.7% (Hvidovre) [1]
			Among clinics with >1000 births/year, Severe perineal tears (grade 3-4) varies between 5.5 % (Hvidovre) and 7.0 % (Odense/Svendborg) [1]
		Resource use	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.[3]
		Care process	Among clinics with >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). [1]

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:

[1] Dansk Kvalitetsdatabase for Fødsler, Årsrapport 2013

[2] 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

[3] Landspatientregistret

* Note: more details available in appendix

Assessment of Ease of implementation in Childbirth

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	-

Limited organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	X[9]	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	X	-	-	-	-	-	
			Other clinically relevant characteristics	X[13]	M	-	X	-	-	-	-	-	Previous births, previous c-sections
	Care process	Treatment process		X[14]	X[15]	-	X	X	-	-	-	-	
		Time			X[16]	-	-	-	-	-	-	-	
		Resource use/costs		X	-	X	X	-	-	-	X[17]	-	
		PREMs		-	M	-	-	X	-	-	-	-	PREMs
	Health outcome indicators			-	X[18]	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[19]	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs
		Process of recovery	Complications	X	X[20]	-	X	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

Satisfactory data availability to get started with improved monitoring

PROMs and PREMs need to be complemented longer term

Information sources:
[1] PAS/Landspatientregistret (LPR) [2] Dansk Kvalitetsdatabase for Fødsler and Dansk Føtalmedicinsk Database.
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Gynaecological disorders, Diabetes [13] Foetal position, premature delivery [13] Length of stay at delivery, readmissons, number of visits in outpatient specialized care [14] Time to epidural/spinal anesthesia, presence of midwife or doctor at maternity ward, time to very emergent c-section [16] Time to emergent c-section, Time to very emergent c-section [17] Sick-leave after birth [18] Mother and child skin-on-skin, Child APGAR score [19] Uncomplicated births under normal conditions, C-section despite normal conditions [20] Births with severe hypoxia in the new-born, major bleeding, severe ruptures in the perineum

* Note: more details available in appendix

Assessment of breast cancer: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	NA
		Incidence	143 per 100 000[1]
	Costs	Direct costs	600 million DKK[2,3]
		Indirect costs	1,3 billion DKK[2,3]
Identified variation		Outcomes	Share of patients with recurring cancer in 5 years following breast preserving treatments varies between 0,7 % (Aalborg) and 2,0 % (HJØRRING)[4]
			Share of patients without surgery-related complications in 30 days varies between 91 % (Esbjerg) and 100 % (Ringsted)[4]
		Care process	Share of patients mapped using sentinel node biopsy varies between 91 % (HJØRRING) and 100 % (Aalborg)[4]
			Share of high risk patients receiving adjuvant medical treatment varies between 61 % (SØNDERBORG) and 93 % (Vejle, HILLERØD)[4]

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:

[1] Ferlay J, Steliarova-Foucher E, Lortet-Tieulent, et Al. Cancer incidence and mortality patterns in Europe: Estimates from 40 countries in 2012. European Journal of Cancer. 2013;49:1374-1403

[2] Luengo-Fernandez R, Leal J, Gray A, Sullivan R. Economic burden of cancer across the European Union: a population-based cost-analysis. Lancet Oncology. 2013;14:1165-1174

[3] Lidgren M, Wilking N, Jönsson B. Cost of breast cancer in Sweden in 2002. European Journal of Health Economics. 2007;8:5-15

[4] Landsdækkende Klinisk Kvalitetsdatabase for Brystkræft

Assessment of breast cancer: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	(X)

Medium organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	X[13]	-	-	-	-	-	
			Other clinically relevant characteristics	X[14]	M	-	-	X[15]	-	-	-	-	Tumor type/prognosis
	Care process	Treatment process		X[16]	X[17]	-	X[19]	X	X	-	-	-	
		Time			X	-	-	-	-	-	-	-	
		Resource use/costs		X[18]	X[19]	X[18]	X[19]	X	X	-	X[20]	-	
		PREMs		-	M	-	-	-	-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	X	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[21]	-	-	X	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs
		Process of recovery	Complications	X[22]	X[23]	-	X	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

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] Landsdækkende Klinisk Kvalitetsdatabase for Brystkræft
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Elixahauser Comorbidity Index, 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, Malign:benign 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

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	6 700 per 100 000[1]
		Incidence	424 per 100 000[1]
	Costs	Direct costs	3.8 billion DKK[1,2]
		Indirect costs	6.4 billion DKK[1,2]
Identified variation		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 us observed

Sources:

[1] Carstensen B, Kristensen J, Ottosen P, Borch-Johnsen K. The Danish National Diabetes Register: trends in incidence, prevalence and mortality. Diabetologia. 2008;51: 2187-2196

[2] Team analysis of Carstensen 2008 and Bolin K, Gip C, Mörk A, Lindgren B. Diabetes, healthcare cost and loss of productivity in Sweden 1987 and 2005—a register-based approach. Diabetic Medicine. 2009;26:928-934

[3] Dansk Diabetes Database

[4] SSI: Patienter med type-2 diabetes' kontaktforbrug i det regionale sundhedsvæsen

Assessment of diabetes: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	X
	Municipal care	-

Medium organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	X[9]	-	-		-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	-		-	-	-	-	
			Other clinically relevant characteristics	-	X[13]	-	-	X[14]	-	-	-	-	Physical activity
	Care process	Treatment process		X[15]	X[16]	-	X[17]	X	-	-	-	-	
		Time			-	-	-		-	-	-	-	
		Resource use/costs		X[15]	-	X	X[17]	X	-	-	X[18]	-	
		PREMs		-	-	-	-		-	-	-	-	PREMs
	Health outcome indicators			-	X[19]	-	-	X	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-		-	X	-	-	
			Objective outcomes	-	X[20]	-	-	X	-	-	-	-	
			PROMs	-	M	-	-		-	-	-	-	PROMs
		Process of recovery	Complications	X[21]	X[22]	-	X		-	X	-	-	
			Time to recovery	-	-	-	-		-	-	-	-	

Limited data availability

- Available data covers many aspects of value based steering
- DAMD close-down limits access to certain relevant data
- PROMs are missing

Information sources:

[1] PAS/Landspatientregistret (LPR)
[2] Dansk Diabetes Database (not complete coverage in primary care)
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Comorbidity index (Elixhasuser, Charlson) [13] Body mass index (BMI), Smoking, Duration of diabetes condition, Primary diagnosis (type of diabetes) [14] LDL cholesterol, microalbuminuria [15] Number of outpatient visits to different health care professionals [16] 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 [17] Metformin (biguanides), sulphonylureas, glitinider, alpha-glucosidase inhibitors, glitazones [18] Sick leave [19] Share of patients with adequate glycemic control (HbA1c <53 mmol/mol), Systolic and diastolic pressure, Cholesterol levels [20] Prevalence and status of complications [21] Prevalence of complications (neurologic, feet, eye, cardio- or cerebrovascular events) [22] Retinopathies and maculopathies, prevalence of blindness

Assessment of hip replacement: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	NA
		Incidence	160 per 100 000
	Costs	Direct costs	700 million DKK[1]
		Indirect costs	2.8 billion DKK[2]
Identified variation		Outcomes	Implant revision in 2 years (primary arthrosis), Hospital: 0.0 % (Thy-Mors Thisted) - 6.9 % (Holbæk)[3]
			Implant revision in 2 years (primary arthrosis), Regional: 1.4 % (Nordjylland) - 3.6 % (Hovedstaden) [3]
			Implant survival 5 years (primary arthrosis), Hospital: 91.0 % (Sydvestjysk Grindsted)) - 100 % (Several) [3]
			Implant survival 5 years (primary arthrosis), Regional: 94.8 % (Hovedstaden) - 96.5 % (Midtjylland).[3]
			Readmission arthroplasty related problems, Hospital: 0.8 % (Frederiksberg Hospital) - 8.2 % (Hvidovre Hospital) [3]
			Readmission arthroplasty related problems, Regional: 3.1 % (Nordjylland) - 5.2 % (Hovedstaden).[3]
		Care process	Blood transfusion, Hospital: 1.0 % (Privathospitalet Hamlet) - 46.5 % (Sygehus Thy-Mors Thisted)[3]
			Blood transfusion, Regional: 10.6 % (Midtjylland) - 21.3 % (Nordjylland).[3]

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

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	-

Low organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	X[13]	-	X[14]	-	-	-	-	-	
			Other clinically relevant characteristics	X[15]	X[16]	-	-	-	-	-	-	-	
	Care process	Treatment process		-	X[17]	-	X	X	-	-	-	-	
		Time		-	M	-	-		-	-	-	-	Time from decision to operation
		Resource use/costs		X[18]	-	X[18]	X	X	-	-	X[19]	-	
		PREMs		-	M	-	-		-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[20]	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs
		Process of recovery	Complications	X[21]	X[22]	-	X[23]	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

Excellent data availability

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

Information sources:
[1] PAS/Landspatientregistret (LPR)
[2] Dansk Fedmekirurgiregister, Årsrapport 2013
[3] Omkostningsdatabasen
[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

Assessment of knee replacement: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	NA
		Incidence	118 per 100 000
	Costs	Direct costs	570 million DKK[1]
		Indirect costs	2.3 billion DKK[2]
Identified variation		Outcomes	Regional level variation: Readmission 30 days, 6.1 % - 10.4 %. Average 8.2 %[3]
			Regional level variation: Mortality rate 90 days, 0.2 % - 0.7 %. Average 0,4 %[3]
			Regional level variation: 1-year arthroplasty revision rate, 1.5 % - 8.2 %. Average 2.9 %[3]
			Regional level variation: 2-year arthroplasty revision rate, 2.3 % - 6.6 %. Average 3.8 %[3]
			Regional level variation: 5-year arthroplasty revision rate, 3.2 % - 9.2 %. Average 5.2 %[3]
		Resource use	Length of hospital stay for TKA, 2.6 (Privathospitaler) - 4.0 (Nordjylland). Average 3.3 days[4]

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 Berntfors 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

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	-

Low organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	X[13]	-	X[14]	-	-	-	-	-	
			Other clinically relevant characteristics	X[15]	X[16]	-	-	-	-	-	-	-	Weight, length, BMI, ASA etc
	Care process	Treatment process		-	X[17]	-	X	X	-	-	-	-	
		Time		-	M	-	-		-	-	-	-	Time from decision to operation
		Resource use/costs		X[18]	-	X[18]	X	X	-	-	X[19]	-	
		PREMs		-	M	-	-		-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[20]	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs
		Process of recovery	Complications	X[21]	X[22]	-	X[23]	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

Excellent data availability

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

Information sources:

[1] PAS/Landspatientregistret (LPR)
[2] Dansk Fedmekirurgiregister, Årsrapport 2013
[3] Omkostningsdatabasen
[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] Preoperative knee score [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

Assessment of multiple sclerosis: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	220 per 100 000[1]
		Incidence	8 per 100 000[1]
	Costs	Direct costs	1.4 billion DKK[2]
		Indirect costs	400 million DKK[2]
Identified variation		Outcomes	Share of patients under treatment and with a starting EDSS-score of 4 or less, reacing an EDSS-score of 4 or more (endpoint) after 5 years of follow-up varies between 47 % (Roskilde) and 94 % (Hillerød)[1]
			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 betwewen 20 % (Rigshospitalet) and 90 % (Herlev)[1]
			Share of patients, treated with biological drugs, with improved or stationary level of pain varies between 87 % (Rigshospitalet) and 100 % (Frederica)[1]
			Share of patients, treated with biological drugs, with improved or stationary level of fatigue varies between 67 % (Fredericia) and 93 % (Svendborg)[1]
		Care process	Average control frequency of JC virus antibodies in immunosuppressed patients varies between 1.2 (Odense) and 2.7 (Sønderborg)[1]
			Share of patients that received annual MRI scan while in treatment varies between 25 % (Roskilde) and 93 % (Sønderborg)[1]
			Share of patients assessed for anti-medication antibodies after 3, 6 and 12 months of treatment varies between 17 % (Odense) and 89 % (Holstebro)[1]
			Share of patients assessed using EDSS score while in treatment varies between 51 % (Odense) and 99 % (Sønderborg)[1]

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

[2] Sobocki P, Pugliatti M, Lauer K, Kobelt G. Estimation of the cost of MS in Europe: Extrapolations from a multinational cost study. Multiple Sclerosis J. 2007;13:1054-1064

Assessment of multiple sclerosis: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	(X)

Medium organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	X[13]	-	-	-	-	-	
			Other clinically relevant characteristics	(X)[14]	M	-	-	-	-	-	-	-	Disease duration
	Care process	Treatment process		X[15]	X[16]	-	X[17]	X	X	-	-	-	
		Time			M	-	-	-	-	-	-	-	Time to diagnosis and treatment
		Resource use/costs		X[18]	X[17]	X[18]	X[17]	-	X	-	X[10]	-	
		PREMs		-	M	-	-	X	-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[19]	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs
		Process of recovery	Complications	X[20]	-	-	X	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

Good 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] Sclerosebehandlingsregistret
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Elixahauser Comorbidity Index, Charlson Comorbidity Index [13]Drug use reflecting comorbidities [14] Proxy for disease duration [15]Number of visits in specialised outpatient care [16,] Frequency of assessment for JC-virus in immunosupressed 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 startup of treatment [17] Use of disease-modifying drugs [18] Resource-use and costs mainly tied to the MS disease and related complications [19] Change in EDSS-score over time, fraction of patients working full time despite disease [20] Inpatient and outpatient care related to relevant complications (diagnoses and procedures)

Assessment of obesity (bariatric surgery): Potential

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

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:

[1] Due P, Heitmann B, Sørensen T. Prevalence of obesity in Denmark. Obesity Reviews. 2007;8:187-189
[2] Borg S, Persson U, Ödegaard K et. Al. Obesity, Survival, and Hospital Costs - Findings from a Screening Project in Sweden. Value In Health.2005;8(5):562-571
[3] Dansk Fedmekirurgiregister, Årsrapport 2013

Assessment of obesity (bariatric surgery): Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	-

Low organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
				Information source types									
Data availability	Patient characteristics	Sociodemographic information		X^{9}	-	-	-	-	-	-	X^{10}	X^{11}	
		Health profile	Comorbidities	X^{12}	X^{13}	-	X^{14}	-	-	-	-	-	
			Other clinically relevant characteristics	X^{15}	X^{16}	-	-	X^{17}	-	-	-	-	
	Care process	Treatment process		X^{18}	X^{19}	-	X	X	-	-	-	-	
		Time		-	M	-	-	-	-	-	-	-	Time to first visit, time to decision/surgery
		Resource use/costs		X^{20}	-	X^{20}	X	X	-	-	X^{21}	-	
		PREMs		-	M	-	-	-	-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X^{22}	-	X^{23}	-	-	-	-	-	
			PROMs	-	X^{24}	-	-	-	-	-	-	-	
		Process of recovery	Complications	X^{25}	X^{26}	-	X^{27}	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	X^{28}	-	

Excellent data availability

- Available data is suitable for value based steering
- PREMs missing

Information sources:

[1] PAS/Landspatientregistret (LPR)
[2] Dansk Fedmekirurgiregister, Årsrapport 2013
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Comorbidity index (Elixhauser, Charlson) [13] Sleep apnea, gastroesophageal reflux, [14] Antidiabetics [15] Previous related surgery [17] HbA1c [18] Length of stay at surgery, readmissons, number of visits in outpatient specialized care [19] Type of procedure, knife time, [20] Related mainly to treatment process and complications [21] Sick leave after surgery [22] Weight reduction, resolution of some comorbidities (joint pains, diabetes) [23] Resolution of some comorbidities (CVD, diabetes) [23] Sick-leave after birth [24] HRQoL (Moorehead) [25] Inpatient and outpatient care related to relevant complications (diagnoses and procedures) [26] Complications requiring intervention, revision surgery within 30 days of and 30 - 365 days after primary surgery [27] Sick leave after surgery

Assessment of prostate cancer: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	
		Incidence	138 per 100 000[1]
	Costs	Direct costs	500 million DKK[2]
		Indirect costs	300 million DKK[2]
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 % (Hospitalsenheden Vest) and 19 % (Aalborg) and for pT3 staged tumors, variation spans from 0 % (Hospitalsenheden Vest) and 77 % (Aarhus)[3]
			Share of patients with urethral stricture complications within 1 year varies between 1 % (Aalborg) and 7 % (Hospitalsenheden 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:

[1] Ferlay J, Steliarova-Foucher E, Lortet-Tieulent, et Al. Cancer incidence and mortality patterns in Europe: Estimates from 40 countries in 2012. European Journal of Cancer. 2013;49:1374-1403

[2] Luengo-Fernandez R, Leal J, Gray A, Sullivan R. Economic burden of cancer across the European Union: a population-based cost-analysis. Lancet Oncology. 2013;14:1165-1174

[3] Dansk Prostata Cancer Database

Assessment of prostate cancer: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	(X)

Medium organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostics db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	X[13]	-	-	-	-	-	
			Other clinically relevant characteristics	X[14]	X[15]	-	-	X	-	-	-	-	
	Care process	Treatment process		X[16]	X[17]	-	X[18]	X	X	-	-	-	
		Time		-	-	-	-	-	-	-	-	-	
		Resource use/costs		X[24]	-	X[24]	X	X	-	-	-	-	
		PREMs		-	M	-	-	-	-	-	-	-	PREMs
	Health outcome indicators			-	X[19]	-	-	X	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	X[20]		-	-	-	X	-	-	
			Objective outcomes	-	X[21]	-	-	-	-	-	-	-	ICHOM indicators: symptomatic skeletal events, castration resistant disease
			PROMs	-	M	-	-	-	-	-	-	-	Pain, sexual dysfunctioning, physical functioning
		Process of recovery	Complications	X[22]	X[23]	-	-	-	-	X	-	-	
			Time to recovery	-	-	-	-	-	-	-	-	-	

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] Dansk Prostata Cancer Database
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Elixahauser Comorbidity Index, Charlson Comorbidity Index [13]Drug usage reflecting comorbidities [14] Skeletal metastases [15]PSA, TNM, prostate volume [16]Number of visits in specialised outpatient care, surgical activities [17] Share of patients receiving adjuvant endocrine therapy, Share of total prostatectomies using nerve preserving technique [18]Use of relevant drugs such as endocrine treatment, bisphosphonates and chemotherapy. [19]Share of patients with radical excision [20] 30-day mortality [21] Share of patients without recurring cancer in 5 years [22] ER-visits related to disease [23]Frequency of blood transfusions, Share of patients with urethral stricture 1 year after surgery [24] Related mainly to treatment process and complications

Assessment of rheumatoid arthritis: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	750 per 100 000[1]
		Incidence	31 per 100 000[2]
	Costs	Direct costs	1.1 billion DKK[1,3]
		Indirect costs	1.5 billion DKK[1,3]
Identified variation		Outcomes	Share of patients, treated with biological drugs, with low disease activity varies between 55 % (Rønne) and 88 % (Kolding)[4]
			Share of patients, treated with biological drugs, with improved or stationary level of functionality varies between 64 % (Holbæk) and 100 % (Frederica)[4]
			Share of patients, treated with biological drugs, with improved or stationary level of pain varies between 87 % (Rigshospitalet) and 100 % (Frederica)[4]
			Share of patients, treated with biological drugs, with improved or stationary level of fatigue varies between 67 % (Fredericia) and 93 % (Svendborg)[4]

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:

[1] Pedersen J, Svendsen A, Hørslev-Petersen K. Prevalence of Rheumatoid Arthritis in the Southern Part of Denmark. The Open Rheumatology Journal. 2011;5:91-97

[2] Pedersen J, Svendsen A, Hørslev-Petersen K. Incidence of Rheumatoid Arthritis in the Southern Part of Denmark from 1995 to 2001. The Open Rheumatology Journal. 2007;1:18-23

[3] Team analysis based on Pederson 2011 and Kalkan A, Hallert E, Bernfort L et Al. Costs of rheumatoid arthritis during the period 1990-2010: a register-based cost-of-illness study in Sweden. Oxford Journals Rheumatology 2014;53:153-160

[4] Dansk Reumatologisk Database

Assessment of rheumatoid arthritis: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	(X)

Medium organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Information source types: Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X[9]	-	-	-	-	-	-	X[10]	X[11]	
		Health profile	Comorbidities	X[12]	-	-	X[13]	-	-	-	-	-	
			Other clinically relevant characteristics	X[14]	M	-	-	-	-	-	-	-	Disease duration
	Care process	Treatment process		X[15]	X[16]	-	X[16]	X	X	-	-	-	
		Time			M	-	-	-	-	-	-	-	Time to treatment
		Resource use/costs		X[17]	-	X[17]	X[16]	X	X	-	X[10]	-	
		PREMs		-	M	-	-	-	-	-	-	-	PREMs
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	-		-	-	-	X	-	-	
			Objective outcomes	-	X[19]	-	-	-	-	-	-	-	
			PROMs	-	X[18]	-	-	-	-	-	-	-	
		Process of recovery	Complications	X[20]	-	-	-	-	-	X	-	-	
			Time to recovery	-	M	-	-	-	-	-	-	-	Time in remission (DAS <2.6)

Excellent data availability

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

Information sources:

[1] PAS/Landspatientregistret (LPR)
[2] Dansk Reumatologisk Database
[3] Omkostningsdatabasen
[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 [10] History of sick leave [11] Educational level, civil status, country of birth [12] Diabetes, Elixahauser 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 de to drug-induced infections

Assessment of stroke: Potential

		Information type	Information
Burden of disease	Epidemiological measures	Prevalence	NA
		Incidence	612 per 100000[1]
	Costs	Direct costs	1.8 billion DKK[2]
		Indirect costs	560 million DKK[2]
Identified variation		Outcomes	30 day mortality varies between 6 % (Amager) and 55 % (HE Midt)
		Resource use	Share of patients being readmitted in 30 days varies between 0 % (Dronninglund) and 22 % (Amager)
		Care process	Share of patients receiving thrombolysis in 1 hour varies between 50 % (Aalborg, Bornholm) and 100 % (Roskilde) [3]
			Share of patients with CVL offered carotid endarterectomy in 14 days varies between 27 % (Holstebro) and 100 % (Vejle, Nordsjælland) [3]
			Share of patients with atrial flutter and CVL, offered anticoagulants varies between 67 % (Sydestjysk) and 100 % (Vejle)

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:

[1] Truelsen T, Piechowski-Jóźwiak B, Bonita R. et al. Stroke incidence and prevalence in Europe: a review of available data. European Journal of Neurology. 2006;13:581-598

[2] Team analysis based on Olesen J, Sobocki P, Truelsen T, et al. Cost of disorders of the brain in Denmark. Nord J Psychiatry. 2008;62:114

[3] Dansk Apopleksiregister

Assessment of stroke: Complexity in implementation

	Organizational level	Integrated part of the care episode
Organizational complexity	Specialized care	X
	Primary care	(X)
	Municipal care	X

High organizational complexity

M=Missing | Regional and national level | Regional level | National level

	Measures type			Adm. Care db [1]	Qual. reg [2]	Cost db [3]	Drug db [4]	Diagnostic db	Municipal care db [5]	Causes of death db [6]	Social insurance db [7]	Socio-demographic db [8]	Example of relevant data missing
Data availability	Patient characteristics	Sociodemographic information		X^{9}	X^{10}	-	-	-	-	-	X^{11}	X^{10}	
		Health profile	Comorbidities	X^{12}	X^{13}	-	X	-	-	-	-	-	
			Other clinically relevant characteristics	X	X^{14}	-	X	X	-	-	-	-	Assessment of stroke severity, consiousness at arrival
	Care process	Treatment process		X^{15}	X^{16}	-	X	X	X^{17}	-	-	-	
		Time		-	M	-	-	-	-	-	-	-	Average time until trombolysis
		Resource use/costs		X^{18}	-	X^{18}	X	X	X^{17}	-	X^{19}	-	
		PREMs		-	-	-	-	-	-	-	-	-	
	Health outcome indicators			-	-	-	-	-	-	-	-	-	
	Health outcomes (patient relevant)	Short and long term outcomes	Mortality	-	X^{20}		-	-	-	X	-	-	
			Objective outcomes	X^{21}	-	-	-	-	-	-	-	-	
			PROMs	-	M	-	-	-	-	-	-	-	PROMs; Quality of life and functional status
		Process of recovery	Complications	X^{22}	-	-	X^{23}	-	-	X	-	-	
			Time to recovery	-	X^{24}	-	-	-	-	-	-	-	

Reasonable data availability

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

Information sources:

[1] PAS/Landspatientregistret (LPR)
[2] Dansk Apopleksiregister Register
[3] Omkostningsdatabasen
[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] Age, sex, marital status, habitation [11] History of sick leave [12] Stroke type, Charlson/Elixhauser comorbitdies [13] Atrial flutter, previous AMI, hypertension, claudicatio, peripheral arterial disease [14] Alcohol, smoking [15] Length of stay [16] Time until hospital admission, Share of patients being directed from primary to specialized care after TIA, Share of patients admitted to dedicated stroke unit, Time until anticoagulation treatment after CVL, Share of patients undergoing CT or MRI on the day of admission, Early access to physiotherapist after CVL, Early evaluation of nutritional status, Early assessment of laryngeal function, Early radiology of carotid arteries, Share of patients undergoing carotid endarterectomy in 14 days, Share of patients with ischemic stroke receiving thrombolysis [17] Use of municipal nursing home care or home care following stroke [18] Resources and costs related to initial hospital stay, readmissions and revisits [19] Return to employment [20] 30 day mortality in cerebrovascular lesion [21] Relapse/reoccuring stroke [22] Major bleeding after thrombolysis, DVT/PE, fracture, UVI [23] Antibiotics [24] Readmission in 30 days after cerebrovascular lesion

Overview of Sveus and ICHOM "standard sets" for the 10 selected patient groups

IVBAR
Deep-dives

Available standard sets – deep-dives

	Sveus	ICHOM
Breast cancer	✗	✓**
Childbirth	✓	✓**
Diabetes	✓	✗
Hip replacement	✓	✓
Knee replacement	✓	✓
Multiple sclerosis	✗	✗
Obesity surgery	✓	✗
Prostate cancer	✗	✓
Rheumatoid arthritis	✗	✗
Stroke	✓	✓

Other available standard sets*

- Spine surgery
- Cleft lip and palate
- Depression and anxiety
- Macular degeneration
- Lung cancer
- Coronary artery disease
- Cataracts

Other planned standard sets**

- Dementia
- Brain tumours
- Colon cancer
- Inflammatory bowel disease
- Frail elderly
- Heart failure
- Cranofacial microsomia

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

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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 casemix-adjusted benchmarking in Denmark: Childbirth analysis using Sveus' definitions

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

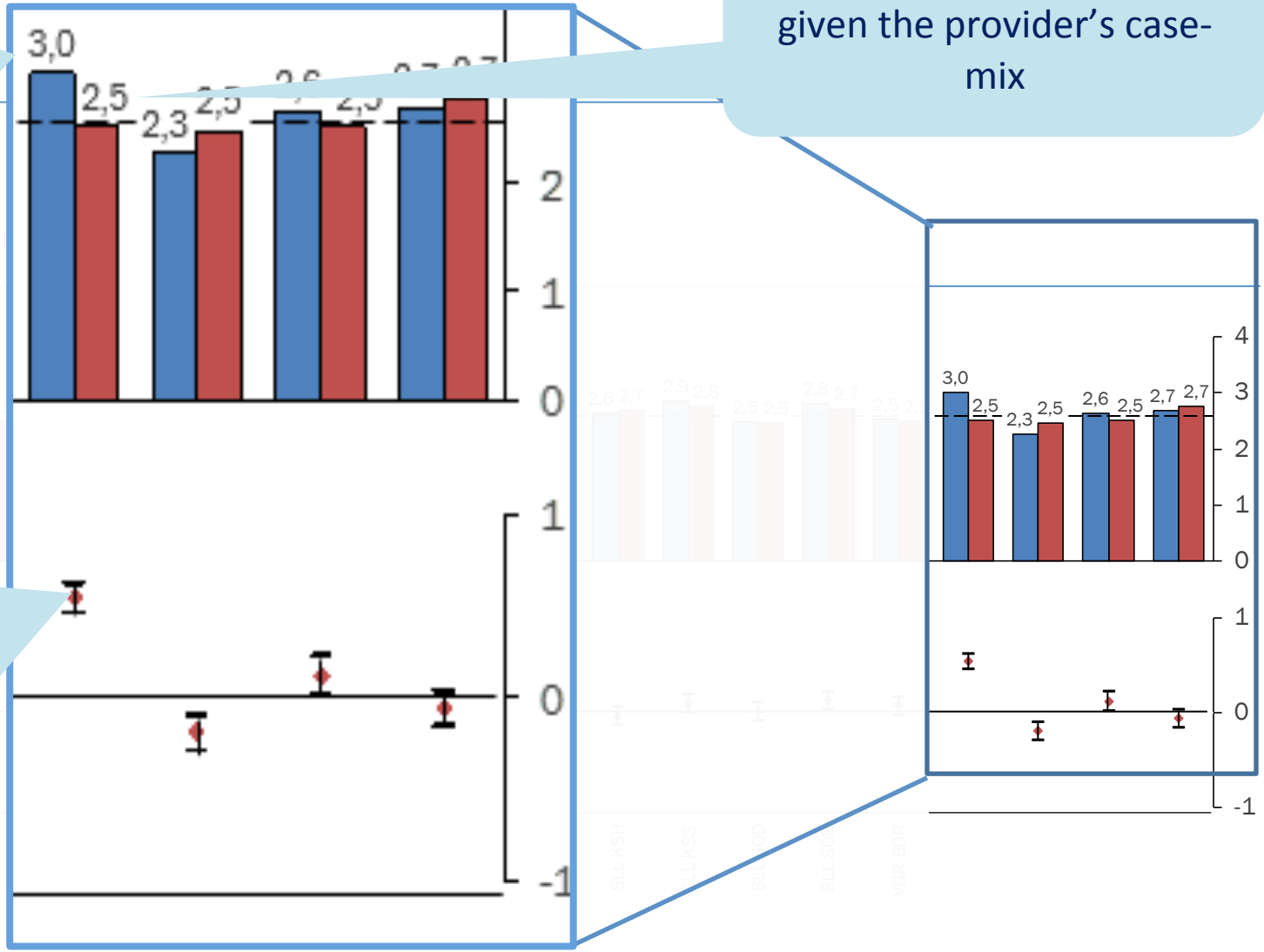
This analysis has been presented to illustrate how existing Danish data can be used to support value based steering and support only. Results need to be validated with child birth experts before it can be used to draw conclusions on performance within the health system

Interpretation of statistical presentation

Provider's actual length of stay

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

Provider's deviation from other providers, adjusted for case-mix



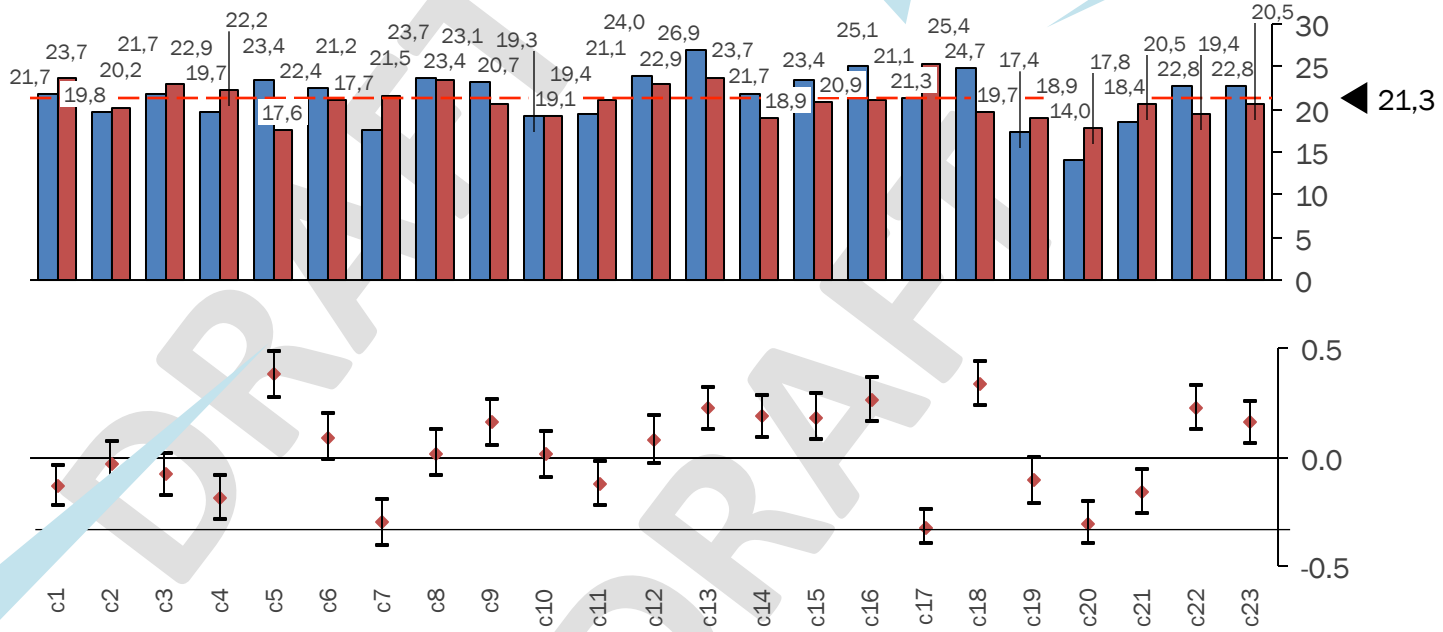
Example of process measure: Significant variations in cesarean sections

ILLUSTRATIVE ANALYSIS ONLY[1]

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

Total n=110 874



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

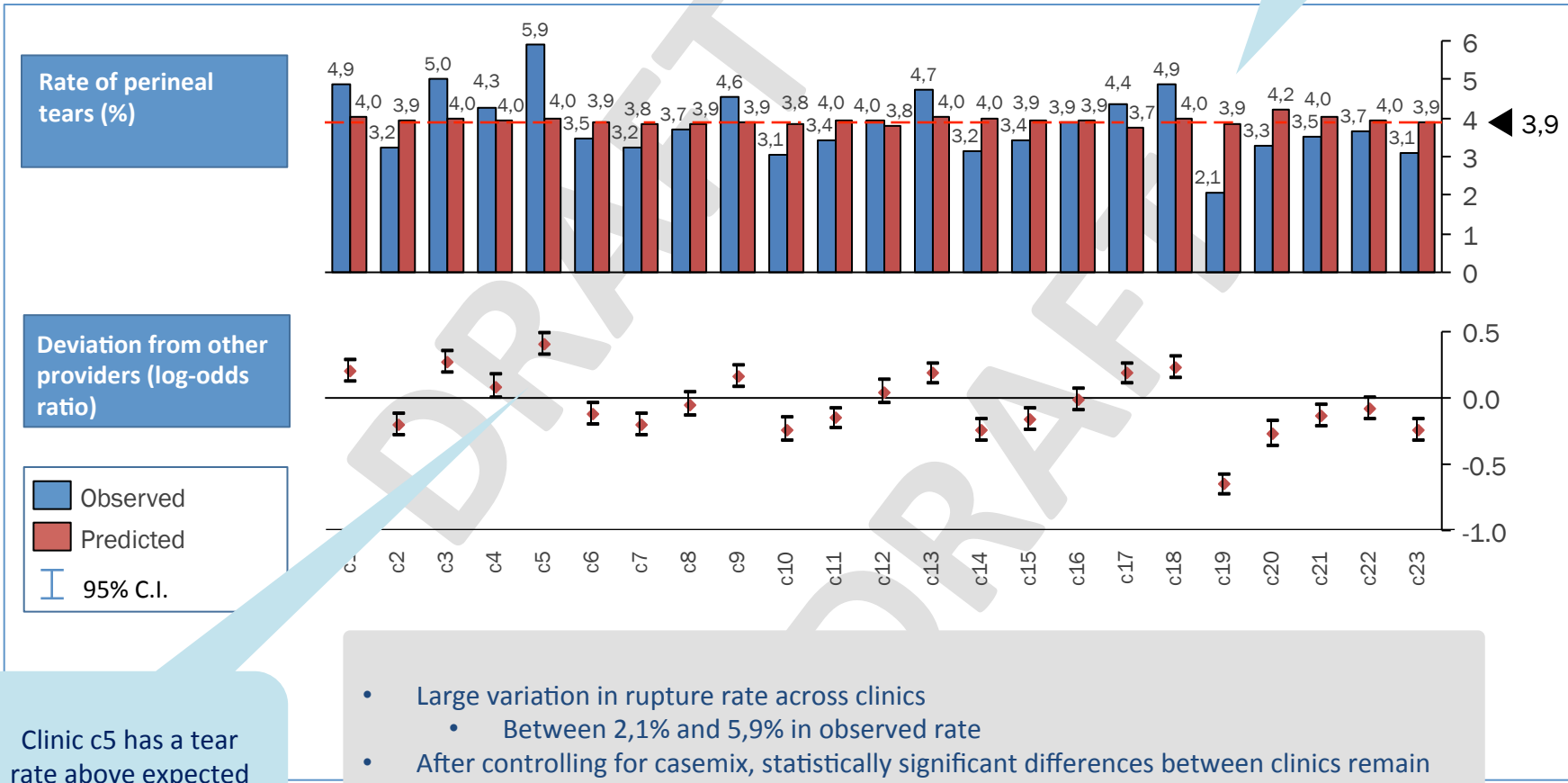
Note: Clinics with <50 births were excluded. Caesarian section identified using a combination of diagnosis codes (O82, O842) and procedure codes (MCA00, MCA10, MCA20, MCA30, MCA33, MCA96). Analysis adjusted for age, multiple birth, fetal position, comorbidities, complications during pregnancy; 1) This 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

ILLUSTRATIVE ANALYSIS ONLY[1]

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

Total n=86 399



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

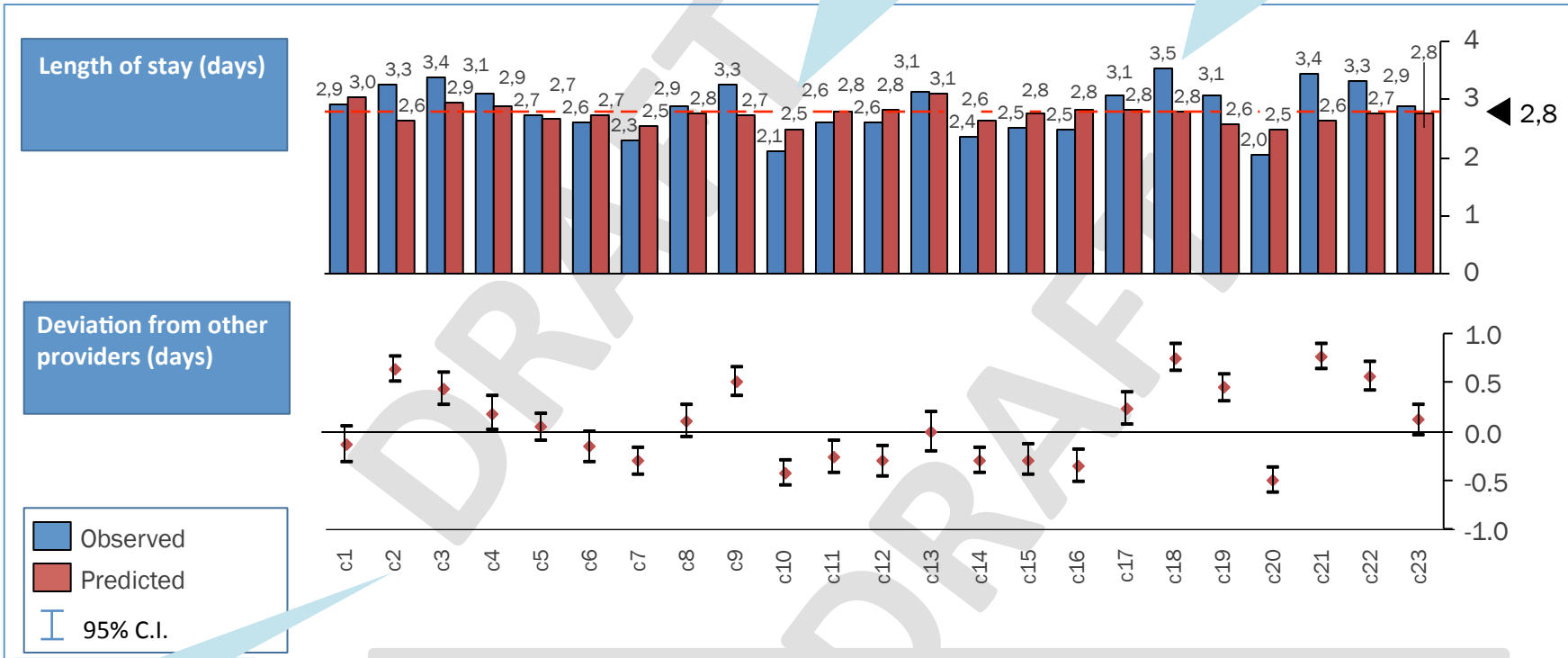
Example of resource indicator: Significant variation in length of stay

ILLUSTRATIVE ANALYSIS ONLY[1]

Clinic c10 has a shorter LoS than predicted (significantly different from other clinics)

Clinic c18 has a longer LoS than predicted (significantly different from other clinics)

Total n=110 874



Clinic c2 has significantly longer LoS compared to other clinics

- 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-inddtof 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 child birth experts before it can be used to draw conclusions on performance of the health system