# Bilaga 3 Tabellverk över inkluderade tabeller/Appendix 3 Included studies

| First author<br>Country<br>Year<br>Reference | Study design<br>Aim<br>Context<br>Connection to health care system<br>Participants | Program theory | Component(s) of value-based health care[1] | Data collection & analysis<br>Outcomes | Author's main conclusions | Comments (by SBU) |
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| Altavela et al<br>USA<br>2017<br><br>[28] | *Study design*<br>Case report<br><br>*Aim*<br>To describe the role of clinical pharmacists and their impact on population health and value-based contracts within a multidisciplinary care management team.<br><br>*Context*<br>159 primary care practices supported by multi-disciplinary care management team.<br><br>*Connection to health care system*<br>Not mentioned<br><br>*Participants*<br>Patients with extraordinary healthcare needs, including those with high or potentially high use of services. | Clinical pharmacists play a key role in population health and value-based contracts; they can help physicians manage their most costly and complex patients and so improve outcomes and reduce medication costs. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Extraction of pharmacy claims data and electronic medical records<br><br>*Analysis*<br>Comparison of outcomes to 12-month period prior to intervention. Analysis conducted for patients meeting GRIPA's high-risk criteria.<br><br>*Outcomes*<br>Annual pharmacy cost savings (2013-2016), readmissions, hospital admissions, emergency room visits, medical charges, patient satisfaction | As part of a multidisciplinary team, clinical pharmacists are able to optimize medication use and engage patients and physicians to reduce medical and medication costs for contracted patients.<br><br>The programme resulted in pharmacy costs savings and reduced readmissions, hospital admissions, emergency room visits and medical charges for GRIPA's high risk criteria patients. | Unclear calculation of outcomes.<br><br>Bias – the authors work for the case organisation<br><br>Some publicity-like formulations about the case organisation |

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| Bolz et al<br>USA<br>2016<br><br>[29] | *Study design*<br>Case report<br><br>*Aim*<br>To describe the early experiences of a bundled payment initiative implemented at New York University Langone Medical Center (NYULMC)<br><br>*Context*<br>University Medical Center<br><br>*Connection to health care system*<br>The traditional pay-for-service model of health care delivery in the United States is financially unsustainable.<br><br>*Participants*<br>Patients undergoing primary total knee arthroplasty (TKA) and total hip arthroplasty (THA). | The Centers for Medicare and Medicaid Services (CMS) demands value, not just quantity, for the money that it spends. Thus, health care providers must adapt to accommodate these new standards. | 3. Move to bundled payments for care cycles<br>4. Integrate care delivery across separate facilities | *Data collection*<br>Not described.<br><br>*Analysis*<br>Comparison of outcomes during baseline period to outcomes after introduction of the bundled payment initiative.<br><br>*Outcomes*<br>Hospital length of stay, discharges to inpatient facilities, cost per episode of care, readmission rate. | The bundled care payment initiative has delivered a significant decrease in patients' length of stay, discharge to inpatient facilities, and cost of the episode of care. In addition, NYULMC has been able to improve the quality of care delivered to TKA and THA patients. | |
| Bunkers B, et al.<br>USA<br>2016<br><br>[30] | *Study design*<br>Case report<br><br>*Aim*<br>Not clearly stated. Aim seems to be to describe the implementation of a new physician compensation model. The plan uses three value-based metrics that determine 5 percent of a physician's compensation.<br><br>*Context*<br>Mayo Clinic Health System (MCHS; a network of clinics and hospitals serving more than 60 communities in Minnesota, Wisconsin and Iowa) | To prepare for value-based payment and achieve high-quality, cost effective care, health systems such as MCHS need to redesign their compensation to physicians to include value-based incentives, based on outcome metrics. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Mayo Clinic Health System registers<br><br>*Analysis*<br>Descriptive reporting of changes in the percentage of physicians achieving target outcomes after one year<br><br>*Outcomes*<br>Physician performance on key measures of clinical outcomes, safety and patient experience. | Results one year after implementation show that, even when a relatively small percentage of compensation is at risk, physicians can be engaged to integrate value-based care into their practices. | Bias – authors work for the case organisation or for organisation providing tools for the programme<br><br>Dubious publication outlet – Healthcare Financial Management is published by the Healthcare Financial Management Association, HFMA, which provided tools for the programme<br><br>Some publicity-like formulations about the case organisation and the programme |

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| | *Connection to health care system*<br>Many hospitals and health systems are grappling with the question of how to compensate their physicians to drive value.<br><br>*Participants*<br>Physicians working within the MCHS | | | | | |
| Caspers et al<br>USA<br>2013<br><br>[31] | *Study design*<br>Unclear<br><br>*Aim*<br>To describe a strategic initiative of one health care system to pioneer innovative methods for improving the quality and value of patients care while reducing the overall costs of care<br><br>*Context*<br>14 hospitals within Catholic Health Initiatives (CHI), a US non-profit health system.<br><br>*Connection to health care system*<br>With the health care environment shifting to value-based payment, health care systems such as Catholic Health Initiatives need to respond.<br><br>*Participants*<br>Hospitals; patients at participating hospitals | There is a shift to value-based payment systems. Collaborative care teams using patient data that is embedded in the workflow can improve care and reduce costs. Nurses play a critical role in all this. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Extraction of system-level data.<br><br>*Analysis*<br>Comparison of outcomes for participating hospitals with outcomes of hospitals not participating in the initiative.<br><br>*Outcomes*<br>Patient satisfaction,<br>Length of stay, Cost (overtime)<br>Productivity<br>Acuity | This model results in new data and information from actual patient care becoming available at the point of care. This new model supports actionable decision making by frontline nursing leaders and other clinicians. | Bias – the lead author works for the case organisation<br><br>Some vague buzzwords and publicity-like formulations about the programme<br><br>Some selective and unclear reporting of claimed improvements resulting from the programme, e.g. presenting savings because of shorter length of stay for one target population at “one hospital” without commenting other participating hospitals.<br><br>No consideration of negative aspects of the programme (difficulties encountered, negative reactions, drawbacks etc.). |
| Colegate-Stone T, et al.<br>UK<br>2016 | *Study design*<br>Prospective longitudinal cohort<br><br>*Aim* | A re-orientation of services according to the VBHC agenda offers opportunities in improving outcomes and | 1. Organize into Integrated Practice Units (IPUs) | *Data collection*<br>Not described<br><br>*Analysis* | The average patient satisfaction was very good with 92% preferring their surgery performed as day surgery rather than as an | Mainly about comparing costs between two different patient groups managed differently – no |

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| [32] | To assess the impact of the day surgery trauma service with regard to its current activity, the outcomes generated, its potential development and its fiscal impact.<br><br>*Context*<br>Day surgery trauma service<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Day surgery trauma list patients (66 cases) during 3-month period vs. inpatient trauma list patients (unknown number) during same period | reducing costs. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | Estimation of average patient satisfaction. Estimation of additional annual margin (profit) generated by performing day surgery rather than inpatient surgery.<br><br>*Outcomes*<br>Post treatment patient satisfaction in day surgery patients, post treatment preference of day surgery care or not, costs/reimbursements /margins (using TDABC approach) in day patient group as compared to inpatient surgery patients. | inpatient. Day surgery was noted to have a higher run rate of cases per unit of time, lower costs and subsequently a better margin generation per minute. The additional annual profit generated by performing a single whole day trauma list in day surgery was approximately £293 000. By focusing on the needs of the patients and placing them at the centre of service re-design constructive change is seen to be possible. The day surgery trauma service can be shown to deliver higher value care. | assessments of clinical outcomes<br><br>Risk of selection bias<br><br>No adjustments for group differences<br><br>Bias – the authors work for the case organisation<br><br>Limited relevance to VBHC - unclear if and if so how VBHC is implemented in the case organisation; the study primarily evaluates existing services according to VBHC principles.<br><br>No consideration of negative aspects of the programme (difficulties encountered, negative reactions, drawbacks etc.). |
| Colldén C, et al.<br>Sweden<br>2017<br><br>[33] | *Study design*<br>Case study<br><br>*Aim*<br>To construct a taxonomy that supports the management of parallel improvement approaches in healthcare.<br><br>*Context*<br>Illustrative qualitative case study conducted in the Department of Psychotic Disorders at the Sahlgrenska University Hospital.<br><br>*Connection to health care system*<br>Not mentioned. | As managers in their daily work apply various improvement approaches, it is necessary to understand how various approaches can or cannot be aligned and combined. | Value definition (Value=Outcomes/Costs) | *Data collection*<br>Interviews with focus on "value":<br>1) Open expert interviews (n=3)<br>2) Semi-structured interviews with various professionals and managers within a department of psychotic disorders (n=17)<br>3) Key informant interviews (n=3)<br><br>*Analysis*<br>Qualitative analysis identifying common and diverging themes capturing views on value creation | Although limited in scope and size, this study shows that taxonomy for improvement approaches can be valuable, both to provide theoretical understanding of contemporary concepts and to support practical management by fostering dialogs around parallel improvement approaches in local contexts, where they are to be adopted and adapted to existing structure and culture. | The study does not evaluate a VBHC reform, even if it does collect data in an organisation that is implementing VBHC and other improvement approaches. |

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| | *Participants*<br>Informants: experts (3), health professionals (17) and key informers (3) | | | processes and value as an outcome.<br>Theoretical development of taxonomy.<br><br>*Outcomes*<br>n.a. | | |
| Cook D, et al.<br>USA<br>2014<br><br>[34] | *Study design*<br>Case report<br><br>*Aim*<br>Not clearly stated, seems to be to report about implementations and effects of a practice redesign effort "focused factory model" to improve the value and to report results by before after comparison.<br><br>*Context*<br>Cardiac surgical care at Mayo Clinic, Rochester, Minnesota.<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Cardiac surgery patients, 769 matched pairs in analysis | In order to match 21st century health care needs, hospitals need to move from the "solution shop model", in which they are structured to diagnose and recommend solutions to unstructured problems, to the 'focused factory model' in which they deliver a limited set of high-quality products. | Value definition (Value=Outcomes/Costs) and individual components:<br>1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient<br>4. Integrate care delivery across separate facilities<br>6. Build an enabling IT-platform | *Data collection*<br>Data from Society of Thoracic Surgeons database<br><br>*Analysis*<br>Propensity scored matched comparison between 2008 and 2012<br><br>*Outcomes:*<br>Clinical outcome and safety (reoperation during hospitalization, thirty-day morbidity and mortality).<br>Utilization outcome (hospital length-of-stay, times in care environment.<br>Costs (for procedures and total length of hospital stay) | We found that creating a focused-factory model within a solution shop, by applying industrial engineering principles and health IT tools and changing the model of work, was very effective in both improving quality and reducing costs. | Relation to value based health care disputable – the described programme has informed VBHC (see p. 751) but does not clearly build on VBHC<br><br>Bias – the authors work for the case organisation |
| Douglas, et al<br>USA<br>2016<br><br>[35] | *Study design*<br>Case report<br><br>*Aim*<br>To describe the basics of the Hackensack UMC Value-Based Care Model and illustrate how it was used it to reduce the costs of patient sitters.<br><br>*Context/setting*<br>University medical center | Organisations need to change in response to value-based purchasing, and nurses play a key role in this. | Value definition (Value=Outcomes/Costs) | *Data collection*<br>Not described.<br><br>*Analysis*<br>Calculation of difference in number of sitters before and after introduction of the intervention.<br><br>*Outcomes*<br>Reduction of sitter usage | Our value-based care model increased quality and reduced cost in the sitter reduction initiative. | Bias – the authors work for the case organisation<br><br>Unclear connection to VBHC – the programme draws on a range of methods and models<br><br>Imprecise description of what the programme actually implies<br><br>Several vague buzzwords and publicity- |

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| | *Connection to health care system*<br>The US reform Affordable Care Act of 2010 and the subsequent shift to a value-centric reimbursement system moved Hackensack UMC to create the model.<br><br>*Participants*<br>None. Intervention aimed at reducing the number of patient sitters at the center. | | | | | like formulations about the case organisation and the programme<br><br>No serious consideration of negative aspects of the programme (difficulties encountered, negative reactions, drawbacks etc.). |
| Dundon JM, et al<br>USA<br>2016<br><br>[36] | *Study design*<br>Case report<br><br>*Aim*<br>Not clearly stated. Appears to be to describe increase in value of total joint arthroplasty care following participation in the Bundled Payments for Care Improvement (BPCI) initiative for total joint arthroplasty<br><br>*Context*<br>Large tertiary urban academic medical centre.<br><br>*Connection to health care system*<br>The BPCI initiative was initiated by the U.S. Centers for Medicare & Medicaid Services (CMS).<br><br>*Participants*<br>721 patients with primary total joint arthroplasty year 1. 785 patients with primary total joint arthroplasty year 3. | Bundled payment can foster efficient, collaborative care while reducing costs and protecting or improving the overall quality of care. | 3. Move to bundled payments for care cycles | *Data collection*<br>Not described<br><br>*Analysis*<br>Average differences between year one and year three<br><br>*Outcomes*<br>Length of stay (days) readmissions, discharge disposition, and cost per episode of care. | Mid-term results from the implementation of Medicare BPCI Model 2 for primary total joint arthroplasty demonstrated decreased LOS, decreased discharges to inpatient facilities, decreased readmissions, and decreased cost of the episode of care in year 3 compared with year 1, resulting in increased value to all stakeholders involved in this initiative and suggesting that continued improvement over initial gains is possible. | Bias – the authors work for the case organisation<br><br>Ill-structured and therefore unclear description of the actual change program implemented in the investigated organization in response to bundled payment.<br><br>No consideration of negative aspects of the programme (difficulties encountered, negative reactions, drawbacks etc.).<br><br>Note that a number of programs were implemented in the organisation to improve quality metrics in response to bundled payment, including a quality-dependent gain-sharing program among surgeons (see Materials and methods) |
| Ebbevi et al<br>Sweden | *Study design*<br>Qualitative study | There is a need for research investigating the applicability of the 3-tier | 2. Measure outcomes & costs for every patient | *Data collection*<br>In-depth interviews using semistructured interview | Although the 3-tier model aims to focus on outcomes relevant to | Some conceptual unclarity in the proposed new model, especially |

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| 2016<br><br>[37] | *Aim*<br>To test the 3-tier model (a hierarchical value scorecard for creating outcome measurements) against the patient's view of value in a chronic care setting.<br><br>*Context/setting*<br>Specialized rheumatology outpatient clinics<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Patients (n=22) with rheumatoid arthritis | model and its assumption to focus on outcomes rather than processes. | | guide, revised iteratively as participants introduced new concepts. Iterations continued until reaching data saturation and no new themes emerged. Mean interview time: 1 hour 34 min.<br><br>*Analysis*<br>Qualitative content analysis in parallel with data collection. Data were openly coded and grouped to form themes using the computer program QSR NVivo v.10.0. Themes were matched with sub-categories in the 3-tier model most fitting the theme using abductive analysis. New themes formed new subcategories.<br><br>*Outcomes*<br>n.a. | patients, it lacks dimensions important to individuals with rheumatoid arthritis. The data illustrate difficulties in finding patients' preferred outcomes and imply tactics for arriving at meaningful measurements. | regarding outcomes vs. process measures (see Theoretical implications) |
| Elbuluk, et al.<br>USA<br>2017<br><br>[38] | *Study design*<br>Case report<br><br>*Aim*<br>To describe the experience of transitioning to a bundled payment program for total joint arthroplasty (TJA)<br><br>*Context*<br>Private health care institution<br><br>*Connection to health care system*<br>In 2009, Centers for Medicare and Medicaid Services began introducing innovative payment models focused on total joint arthroplasty (TJA).<br><br>*Participants*<br>Patients undergoing TJA | Bundled-payment strategies provide incentives for physicians and health care professionals to eliminate unnecessary services and reduce costs. | 1. Organize into Integrated Practice Units (IPUs)<br>3. Move to bundled payments for care cycles<br>4. Integrate care delivery across separate facilities | *Data collection*<br>Not described.<br><br>*Analysis*<br>Comparison of outcomes after 3 years with the program.<br><br>*Outcomes*<br>Patient satisfaction, complication rate and overall costs. | At our institution, early demonstrations have shown that bundling can reduce costs and improve patient care. | |

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| Erichsen Andersson et al Sweden 2015<br><br>[39] | *Study design*<br>Case study<br><br>*Aim*<br>To explore how representatives from four project teams understand the concept of VBHC, since each representative is responsible for one of the pilot projects implementing VBHC at a university hospital in Sweden.<br><br>*Context*<br>Swedish University Hospital, (Sahlgrenska)<br><br>*Connection to health care system*<br>Value-based management is a growing trend in Swedish healthcare.<br><br>*Participants*<br>N=20 persons, from the four pilot teams. Each team consisted of different professions. | How implementers understand what is being implemented, e.g. VBHC, is important for successful implementation. | Value definition (Value=Outcomes/Costs) and individual component:<br>2. Measure outcomes and costs for every patient | *Data collection*<br>Open-ended interviews with representatives of four project teams. The interview transcripts were imported into NVIVO 10 (software for qualitative analysis QSR International, Pty Ltd).<br><br>*Analysis*<br>Qualitative content analysis of the transcribed interviews by organizing units of meaning, nodes and themes.<br><br>*Results/Outcomes*<br>Five themes emerged: 1) The point of departure was seen to be healthcare professionals' view versus the patient's view, 2) The costs perspective, 3) A new method of governance, 4) Benchmarking, 5) Improvements guided by outcome measures. | The understanding of VBHC focused on creating patient value and measuring bio-medical outcomes and costs; but costs are to some extent de-emphasized in this study<br><br>To measure value for the patients, it was the health professionals' perspective about what patient should value that dominated the understanding of the concept VBHC. VBHC was understood as a strategy to strengthen value innovations and to loosen the grip of economic control. Changes in organizational culture were understood by participants as a need to change healthcare from being professional-centred to patient-centred. The way the concept was understood omits parts of the original concept.<br><br>VBHC was understood differently by different participants.<br><br>The way VBHC was understood omits several parts of the original concept. Hospital management teams need to be aware of and manage the implementation of VBHC based on how differently | The articles by {Nilsson, 2017 #13}, {Nilsson, 2017 #12} and {Nilsson, 2017 #1223} are conducted in the same setting.<br><br>Provides valuable knowledge about implementation of VBHC in care delivery organisations (e.g. hospitals).<br><br>Study in Swedish context, with high relevance to Swedish healthcare.<br><br>No real discussion of generalisability of results. |

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| | | | | | implementers understand VBHC. | |
| Feeley, et al.<br>USA<br>2010<br><br>[40] | *Study design*<br>Case report<br><br>*Aim*<br>To describe an approach for assessing the value created when treating cancer patients in a multidisciplinary care setting within a comprehensive cancer center<br><br>*Context*<br>The university of Texas MD Anderson Cancer Center<br><br>*Connection to health care system*<br>At the core of the variability problem in US healthcare lies the current reimbursement system, which rewards providers for the volume and intensity of services provided rather than for quality, safety, effectiveness, or value.<br><br>*Participants*<br>N=2 467 patients with head and neck cancer (laryngeal cancer, oropharyngeal cancer, and cancer of the oral cavity) treated at MD Anderson between 1997 and 2006. | The VB competition theoretical framework is applicable to health care and enables the measurement of outcomes and costs. | Value definition (Value=Outcomes/Costs) and all six individual components. | *Data collection*<br>From tumour registry, retrospective chart review and a cost accounting system.<br><br>*Analysis*<br>Examination of outcomes and costs<br><br>*Outcomes*<br>Patient outcomes: Survival, degree of recovery (ability to speak and swallow)<br><br>Care process outcome: time to evaluation and completion of treatment<br><br>Economic outcomes: Costs. | We have demonstrated that it is possible to use existing systems and registries to develop, for a given condition, outcome measures of importance to patients and providers.<br><br>Public reporting of this type of data for a variety of conditions can lead to improved competition in the healthcare marketplace and, as a result, improve outcomes and decrease health expenditures. | |
| Fong et al.<br>USA<br>2011<br><br>[41] | *Study design*<br>Case report<br><br>*Aim*<br>To describe a framework of standardized pathways created for delivery of comprehensive care of patients with acute coronary syndrome (ACS)<br><br>*Context/setting* | A value-oriented pathway can optimize patient outcomes, minimize complications [actually an outcome as well], and reduce costs. | 1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient<br>3. Move to bundled payments for care cycles<br>4. Integrate care delivery across separate facilities<br>6. Build an enabling IT-platform | *Data collection*<br>No empirical data<br><br>*Analysis*<br>None.<br><br>*Outcomes*<br>No assessment of outcomes. | By using evidence-based pathways, we believe that patient outcomes can be improved and healthcare costs can be better controlled. | No empirical data. |

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| | Vanderbilt university medical center<br><br>*Connection to health care system*<br>This evidence-based practice model was formulated in response to upcoming changes in quality measures and reimbursement models established in the Patient Protection and Affordable Care Act.<br><br>*Participants*<br>Patients with ACS | | | | | |
| Gordon SM, et al<br>USA<br>2011<br><br>[42] | *Study design*<br>Case report<br><br>*Aim*<br>To examine the community-based parenteral anti-infective therapy program (CoPAT) at the Cleveland Clinic as a model for antimicrobial stewardship for patients requiring parenteral antimicrobial therapy at the time of discharge from the inpatient setting.<br><br>*Context*<br>Cleveland Clinic<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Patients requiring community-based parenteral anti-infective therapy. | Outcomes improve when components of care are integrated (often by nurse-directed teams) | 4. Integrate care delivery across separate facilities | *Data collection*<br>Cleveland Clinic hospital electronic health record (EHR).<br><br>*Analysis*<br>Descriptive results of 36-month period<br><br>*Outcomes*<br>Number of patients; courses of CoPAT; ethnicity of patients; number of antibiotics/patient; types of microorganism; type of antibiotics prescribed; reason for emergency department visits; reasons for readmission | Attention to antimicrobial stewardship and patient care should not end once the patient is discharged from the hospital or other institutional setting. Patients expect and should receive value-based health care across the full cycle of their medical condition, and it is the responsibility of those caring for them to prepare for and provide such care during as well as after hospital discharge. The CoPAT program at the Cleveland Clinic provides a model for the extension of antimicrobial stewardship into the outpatient setting. | Just descriptive data. No comparison, no clear conclusion. |
| Govaert et al<br>Netherlands<br>2015<br><br>[43] | *Study design*<br>Systematic review<br><br>*Aim* | Auditing combined with systematic feedback of process and outcomes information results in lower costs in surgical care. | Value definition (Value=Outcomes/Costs) | *Data collection*<br>Literature search in the databases Pubmed, Embase, Web of Science, and Cochrane Library. | All six identified articles in the review describe a reduction in complications and thereby a reduction in costs due to surgical | |

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| | To determine if auditing combined with systematic feedback of information on process and outcomes of care results in lower costs of surgical care.<br><br>*Context*<br>Hospitals<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Patients undergoing various forms of surgery. | | | Search period till 21-08-2013. Six studies were included (3 with non-original data and 3 with original clinical data).<br><br>*Analysis*<br>Reporting of results in the included studies. All costs are stated in U.S. dollars and inflated to 2013 using the Consumer Price Index.<br><br>*Outcome*<br>Cost savings | auditing. Surgical auditing may be of greater value when high-risk procedures are evaluated, since prevention of adverse events in these procedures might be of greater clinical and therefore of greater financial impact. | |
| Govaert et al Netherlands 2016<br><br>[44] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To investigate whether improving the quality of surgical colorectal cancer care, by using a national quality improvement initiative, leads to a reduction of hospital costs.<br><br>*Context*<br>29 Dutch hospitals<br><br>*Connection to health care system*<br>With the introduction of the Dutch Surgical Colorectal Audit (DSCA) in 2009, robust quality information became available, enabling monitoring, evaluation, and improvement of surgical colorectal cancer care in the Netherlands.<br><br>*Participants*<br>9,913 patients with colorectal cancer | When quality improves, costs will be reduced. | Value definition (Value=Outcomes/Costs) and individual component:<br>2. Measure outcomes and costs for every patient | *Data collection*<br>Clinical data were obtained from the 2010 to 2012 population-based Dutch Surgical Colorectal Audit.<br><br>*Analysis*<br>OR and RD: risk adjusted for hospitals and differences in patient characteristics.<br><br>*Outcomes*<br>Primary clinical outcomes: Postoperative mortality; severe complications.<br>Primary financial outcome: total costs of hospital care.<br>Other outcomes: length of hospital stay, costs of primary admission and costs of first 90 days after discharge. | Participation in a nationwide quality improvement initiative with continuous quality measurement and benchmarked feedback reveals opportunities for targeted improvements, which can drive the medical field forward in continuous improvement of the value of health care delivery. | |

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| Inverso, et al<br>USA<br>2015<br><br>[45] | *Study design*<br>Case report<br><br>*Aim*<br>To evaluate the diagnosis of plagiocephaly using time-driven activity-based costing methods to increase value within our clinic.<br><br>*Context*<br>Children's hospital<br><br>*Connection to health care system*<br>In the context of the anticipated<br>changes to national health care, providers should consider methods such as TDABC to best identify opportunities that increase shared value for both patients and providers.<br><br>*Participants*<br>Plagiocephaly patients | As health care expenditures in the US approach 20% of GDP, cost reduction seems to hold the greatest potential to improve value. | Value definition (Value=Outcomes/Costs) and individual components:<br>1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient | *Data collection*<br>1.Measurement of total activity time a patient spent interacting with a clinician or waiting for the next activity within their visit. 2. Patient satisfaction survey.<br><br>*Analysis*<br>Calculation of average time of each activity. Calculation of differences in outcomes before and after process improvement.<br><br>*Outcomes*<br>Patient visit-time, cost of personel, patient satisfaction. | This pilot study effectively demonstrates the novel use of time-driven activity-based costing in combination with the value equation as a metric for continuous process improvement programs within the health care setting. | |
| Keel et al<br>2017<br><br>[46] | *Study design*<br>Systematic review<br><br>*Aim*<br>To explore why time-driven activity-based costing (TDABC) has been applied in health care, how its application reflects a seven-step method developed specifically for VBHC, and implications for the future use of TDABC.<br><br>*Context*<br>General health care context<br><br>*Connection to health care system* | We will better understand the cost of care delivery in VBHC if we understand TDABC applications | 2. Measure outcomes and costs for every patient | *Data collection*<br>Extraction of data from articles included in the systematic review.<br><br>*Analysis*<br>Conventional inductive content analysis; directed content analysis approach (seven-step model).<br><br>*Outcomes*<br>Not applicable. | TDABC is applicable in health care and can help to efficiently cost processes, and thereby overcome a<br>key challenge associated with current cost-accounting methods. The method's ability to inform bundled payment reimbursement systems and to coordinate delivery across the care continuum remains to be demonstrated in the published literature, and the role of TDABC in this cost-accounting landscape is still developing. | |

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| | Health care organizations around the world are investing heavily in value-based health care (VBHC).<br><br>*Participants*<br>Not specified. | | | | | |
| Kirkpatrick et al<br>USA<br>2013<br><br>[47] | *Study design*<br>Case report<br><br>*Aim*<br>Not clearly stated. Seems to be to test the hypothesis that value-based analysis can positively affect both quality and cost in the treatment of deep venous thrombophlebitis (DVT).<br><br>*Context*<br>Eight hospitals within Medstar Health<br><br>*Connection to health care system*<br>Since the passing of the Affordable Care Act, quality, value, cost, and best practices (BPs) are imperatives of economic survival for both institutions and physicians.<br><br>*Participants*<br>Patients with DVT | Value-based analysis will identify best practices for maximum benefits regarding quality and low cost. | Value definition (Value=Outcomes/Costs) and individual component:<br>2. Measure outcomes and costs for every patient | *Data collection*<br>Practice patterns questionnaire to each hospital + interviews with hospital representatives. Cost and quality data obtained "from several sources".<br><br>*Analysis*<br>Determination of practice patterns and costs of the practice in each of the 8 Medstar Hospitals. Comparison of costs quality measures across hospitals.<br><br>*Outcomes*<br>Surgical quality of care measures; Outcomes of DVT prophylaxis among surgical patients; Dose and cost of anticoagulants; anticoagulant savings opportunity | There were substantial variations in the type of DVT prophylaxis used by the hospitals with no difference in outcomes. A single best practices (BPs) increased value and resulted in savings of $1.5 million, with a savings opportunity of nearly $4 million. | Difficult to understand. Several steps: determining best practice, assessing current practice, suggesting the use of best practice, implementation and evaluating the effects of implementation – all in one study. Not clearly described. No control.<br><br>The validation of a BP can be very difficult. Value-based system is only as good as the variables chosen to measure quality and cost. |
| Low et al.<br>Singapore<br>2017<br><br>[48] | *Study design*<br>Retrospective cohort<br><br>*Aim*<br>To evaluate the effectiveness of a Transitional Home Care program that applied the IPU concept (THC-IPU).<br><br>*Context*<br>Singapore general hospital | Care integration is expected to achieve better health outcomes and reduce cost. | 4. Integrate care delivery across separate facilities | *Data collection*<br>Folllow-up of outcomes of 541 patients enrolled in the THC-IPU program and 625 controls receiving standard care.<br><br>*Analysis*<br>Backward stepwise logistic regression model. Subgroup analyses to study the | The THC-IPU program was associated with reduced likelihood of hospital readmission and ED<br>attendance rates at 30 days and up till 90 days after hospital discharge, which is suggestive of a positive contribution from transitional care organized | |

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| | *Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Patients with functional dependence admitted to the hospital. | | | effectiveness of the program for different patient subgroups.<br><br>*Outcomes*<br>Primary outcome: Proportion of patients with readmission within 30 days. Secondary outcomes: proportion of patients with readmission within 90 days; proportion of patients with an emergency department (ED) attendance within 30 and 90 days of enrollment. | as an integrated practice unit. | |
| Malkani AL, et al.<br>USA<br>2017<br><br>[49] | *Study design*<br>Prospective longitudinal study<br><br>*Aim*<br>To describe care use, comorbidities, and complications among octogenarians undergoing primary total hip arthroplasty (THA)<br><br>*Context*<br>Hospital, inpatient services<br><br>*Connection to health care system*<br>With the advent of bundled payment models enacted by the CMS, institutions and providers are financially penalized for complications and readmission.<br><br>*Participants*<br>Patients diagnosed with hip osteoarthritis undergoing primary THA. Comparison of octogenarians with other age-groups above 65 years. | The burden of care among older patients (comorbidity etc) are not accounted for in VBC-programs. By identifying specific risk factors (for the studied group) readmission and extra costs will decrease. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Data extracted from Medicare national administrative claims data. The average length of follow-up was 6 years (SD 4 years).<br><br>*Analysis*<br>Comparison of risk factors and complications between the octogenarian group versus those aged 65 to 69 years. Multivariate Cox regression was used to evaluate the effect of patient/hospital factors on risk of revision, periprosthetic joint infection, dislocation, venous thromboembolism (VTE), and mortality.<br><br>*Outcomes*<br>Risk of revision/ arthrotomy, prosthetic joint infection (PJI), dislocation, VTE, and mortality. | Octogenarians are at increased risk of dislocation, VTE, medical complications, and mortality after THA. VBC models that penalize hospitals for readmissions and complications may inadvertently result in loss of access to care for these patients as a result of the financial makeup of these bundled care models.<br><br>Financial losses may lead to institutions from withdrawing from the Bundled Payments for Care Improvement program. To prevent this from happening to vulnerable patient population, bundled care programs should evolve and be modified to allow for risk stratification in the overall payment formula to account for increased age and comorbid conditions to ensure continued successful participation in | |

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| | | | | | the program among all the stakeholders. | |
| McCray, et al.<br>USA<br>2017<br><br>[50] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To evaluate the number of pre-operative MRIs ordered before and after implementing an institution wide breast cancer care paths<br><br>*Context*<br>Breast Services Department, Cleveland Clinic<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>1 515 patients diagnosed with invasive breast cancer or ductal carcinoma in situ (DCIS) during years 2012, 2014, and January through May 2015. | A diagnostic treatment (MRI) can be used too often and cause unnecessary costs. Expert consensus can decrease the unnecessary use and the costs | 1. Organize into Integrated Practice Units (IPUs) | *Data collection*<br>Retrospective review of clinic medical records.<br><br>*Analysis*<br>Descriptive comparison of percentages utilizing MRI by year. Logistic generalized linear mixed model of the likelihood of having a preoperative MRI by year.<br><br>*Outcomes*<br>Use of pre-operative MRI; MRI ordered for indications other than those designated in care path; MRI ordered for care path indications. | Implementation of online breast cancer care paths at our institution was associated with a decreased use of pre-operative MRI overall and in patients without a breast cancer care path indication, driving value based care through the reduction of pre-operative breast MRIs. | |
| McLaughlin, et al.<br>USA<br>2014<br><br>[51] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To assess the impact of coordinated implementation of processes across the episode of surgical care on value of neurosurgical care.<br><br>*Context*<br>Department of Neurosurgery at the University of California, Los Angeles (UCLA)<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants* | Focusing on a single outcome is not sufficient to define completely the value of care delivered to patients. Value is the multiple outcomes of the entire bundle of improvement processes in the whole care episode, quantitatively measured. | Value definition (Value=Outcomes/Costs) and individual components:<br>1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient | *Data collection*<br>Review of clinical notes, radiographic images, and operative notes. Extraction of data from electronic medical records.<br><br>*Analysis*<br>Between-group comparison of patients operated on prior to the implementation of improvement processes with patients operated on following the implementation and maturation of the improvement measures<br><br>*Outcomes*<br>Mortality rate, symptom resolution, pre-incisional | Comprehensive implementation of improvement processes throughout the continuum of care resulted in improved global outcome and greater value of delivered care. | |

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| | Patients with either trigeminal neuralgia (n=31) or hemifacial spasm (n=18) undergoing first-time microvascular decompression (MVD) | | | preparation time, surgical procedure time, total operating room time, mean and median overall length of stay (LOS), mean LOS on the floor, frequency of complications and frequency of readmissions. | | |
| McLaughlin, et al.<br>USA<br>2014<br><br>[52] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To assess how cost measurement and strategic containment could be used to optimize the value of delivered care after the implementation and maturation of quality improvement initiatives<br><br>*Context*<br>Department of Neurosurgery at the University of California, Los Angeles (UCLA)<br><br>*Connection to health care system*<br>Numerous elements of national health reform are aimed at cost containment.<br><br>*Participants*<br>Consecutive patients (n=44) undergoing microvascular decompression. Group 1: patients treated prior to implementation of quality improvement interventions. Group 2: patients treated after the implementation and maturation of quality improvement processes. Group 3: patients studied after the implementation of cost containment interventions targeting the three most expensive activities. | Knowing exactly what it costs to deliver an optimal value of care will empower health organizations to negotiate bundle payments, to remain profitable and to ensure competitiveness. | Value definition (Value=Outcomes/Costs) and individual component:<br>2. Measure outcomes and costs for every patient | *Data collection*<br>Review of hospital records including clinical notes (outpatient and inpatient), radiographic images, and operative notes. Charges and costs were retrieved from accounting system.<br><br>*Analysis*<br>Calculation of average/median/percentages by group. Fisher's exact test and Student t-test were used to compare data between Groups 1 and 3.<br><br>*Outcomes*<br>Pre-incisional preparation time, surgical procedure time, total operating room (OR) time, total OR cost, cost of intraoperative neuromonitoring (IOM), length of stay (LOS), postoperative ICU bed allocation cost, percentage of patients discharged before noon, average cost for bed assignment. | In the present study, the optimization of teamwork during pre-incision time in the OR, revision of the IOM protocol, revision of "routine" postoperative admission to the ICU, and reduction in the LOS were identified as cost containment and potentially cost-reduction opportunities. Reductions in the cost of care delivery do not necessarily result in net savings for hospital finances; however, they do translate into improved value of care when outcomes are either maintained or improved. | A pilot study to assess costs of care delivery from a cost accounting system: evaluating two methodologies/strategies to drive cost containment and reduction |

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| Nilsson et al<br>Sweden<br>2017<br><br>[53] | *Study design*<br>Case study<br><br>*Aim*<br>To gain a deeper understanding of VBHC when used as a management strategy to improve patients' health outcomes<br><br>*Context*<br>Swedish University Hospital, (Sahlgrenska)<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>N=20 persons, from four pilot teams with experience of implementing VBHC and belonging to different healthcare professions | Process-evaluation of implementing of VBHC needs to focus on how professional's motives are triggered by VBHC<br><br>Creating value for patients supports professionals' intrinsic drive/engagement/fulfilment and patients' health outcome. | 2. Measure outcomes and costs for every patient | *Data collection*<br>Qualitative interviews with each participant three times each during a period of two years using a thematic interview guide. All interviews were transcribed verbatim. The transcripts were imported into NVIVO 10 (software for qualitative analysis QSR International, Pty Ltd). Tentative analysis sent to the participants to receive their feedback which was used as a basis for the forthcoming interviews.<br><br>*Analysis*<br>Qualitative content analysis of the transcribed interviews by meaning units, dimensions and themes based on the study aim.<br><br>*Results/outcomes*<br>3 themes: Patient-related improvements; Process-related improvements: solving problems related to admission and discharge; Measurement-related improvements: solving the problem of lack of reliable health outcome measures | VBHC worked as a trigger for initiating improvements related to processes, measurements and patients' health outcomes. VBHC contributed a structure for measurement and for identifying the need of improvements. If improvements are really to be implemented and sustainable in the long run, it is vital to anchor the need for them among all staff involved in providing care for the patients. Managers at different organizational levels need to be aware of these difficulties. They need to create structures to facilitate broad engagement and to show endurance and perseverance when carrying through the change processes that have been initiated. | See article by Erischsen Andersson et al {Erichsen Andersson, 2015 #1384} which was conducted in the same setting. |
| Nilsson et al<br>Sweden<br>2017<br><br>[54] | *Study design*<br>Case study<br><br>*Aim*<br>To explore how representatives of four pilot project teams experienced implementing VBHC in a large Swedish University Hospital over a period of 2 years<br><br>*Context* | Process-evaluation of implementing of VBHC needs to focus on the role of change agents and project teams' experiences | 2. Measure outcomes and costs for every patient | *Data collection*<br>See {Nilsson, 2017 #13}<br><br>*Analysis*<br>See {Nilsson, 2017 #13}<br><br>*Results/outcomes*<br>Three main themes emerged, all related to the temporality of implementing VBHC: getting started, being on the road, and being able to look ahead. | Healthcare organizations implementing VBHC will benefit from emphasizing value for patients as well as managing the process of implementation on the basis of understanding the complexities of healthcare. Paying attention to the patients' voice is a most important concern and is also a key | See article by Erichsen Andersson et al {Erichsen Andersson, 2015 #1384} which was conducted in the same setting. |

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| | Swedish University Hospital, (Sahlgrenska)<br><br>*Connection to health care system*<br>VBHC as a concept has in recent years become established in Swedish healthcare organizations, in particular in hospitals<br><br>*Participants*<br>See {Nilsson, 2017 #13} | | | Among the related subthemes identified were: pros and cons of being guided by consultants, the process of identifying outcome measurements, patients' involvement, measurement as a means to improvement and coordination between different developmental projects | towards increased engagement from physicians and care providers for improvement work. | |
| Nilsson et al<br>Sweden<br>2017<br><br>[55] | *Study design*<br>Case study<br><br>*Aim*<br>To explore learning experiences from the two first years of the implementation of value-based healthcare (VBHC) at a large Swedish University Hospital<br><br>*Context*<br>Swedish University Hospital, (Sahlgrenska)<br><br>*Connection to health care system*<br>In recent years, VBHC has gained increasing attention in Sweden. Several Swedish healthcare organizations, especially hospitals, have started to implement these ideas.<br><br>*Participants*<br>N=19 persons, from four pilot teams with experience of implementing VBHC and belonging to different healthcare professions | VBHC is expected to contribute to organizational learning. | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Individual open-ended interviews. Interviews were digitally recorded and transcribed verbatim. The transcripts were imported into NVIVO 10 (software for qualitative analysis QSR International, Pty Ltd).<br><br>*Analysis*<br>See {Nilsson, 2017 #13}<br><br>*Results/outcomes*<br>Three main themes pinpointing learning experiences emerged through the analysis: resource allocation to support implementation, anchoring to create engagement and dedicated, development-oriented leadership with power of decision. | Experiences from the process of implementing VBHC showed that time for reflection is required to enable questioning of taken-for-granted assumptions and to open up for double-loop learning. It is essential to challenge health professionals' conceptions and suppositions and not only to correct errors identified in the existing processes of healthcare. Challenging conceptions and suppositions contributes to double-loop learning. It is not enough to reflect on new experiences once and for all or to create new ideas and test them. Instead of seeing learning as a closed-circuit process, it can be fruitful to consider learning as a continuous ongoing spiral. Learning in relation to VBHC should therefore be seen as a continuous learning journey. | See article by Erischsen Andersson et al {Erichsen Andersson, 2015 #1384} which was conducted in the same setting. |

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| Parra et al.<br>Spain<br>2017<br><br>[56] | *Study design*<br>Two parts: 1) development of methodology for value assessment and 2) prospective value assessment of five centres<br><br>*Aim*<br>To develop a comprehensive methodology for assessing haemodialysis centres based on the value of health care. To assess the value of health care and rank five different haemodialysis centres<br><br>*Context/setting*<br>Haemodialysis centres<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>In development of methodology: expert group composed of 9 individuals who represented the haemodialysis stakeholders.<br>In testing the methodology: five haemodialysis centres, 220 patients | Quality management can reduce disparities and thereby contribute to achieving the best possible outcomes for patients and the community<br><br>Methodology (Multi-criteria Decision Analysis such as the Weight Sum Model) can integrate perspectives of stakeholders and establish comprehensive outcomes that provide more accurate, assessment of the treatment. | 2. Measure outcomes and costs for every patient | *Data collection*<br>The selected outcome variables were collected by each centre. Cost data were prospectively collected by the accounting department of each centre.<br><br>*Analysis*<br>A nephrology quality management group identified the criteria for the assessment. An expert group agreed on the weighting of each variable, considering values and preferences. Multi-criteria methodology was used to analyse the data. The case-mix adjusted value of health care for each centre was calculated.<br><br>*Outcomes*<br>Evidence-based clinical performance measures (including dialysis adequacy; haemoglobin concentration; mineral and bone disorders; type of vascular access; and hospitalization rate), mortality, patient satisfaction, health-related quality of life (HRQoL), and costs. | Our results supported the notion that value can be assessed in haemodialysis centres based on a comprehensive set of outcomes, which include meaningful clinical results, mortality, HRQoL, patient satisfaction and costs. | |
| Parvinen, et al.<br>Finland<br>2010<br><br>[57] | *Study design*<br>Case study<br><br>*Aim*<br>To provide a case study that demonstrates the financial benefit of value-based health care from a managerial and strategic perspective, as well as proposing governance and management methods to aid the process. | More effective management of the processes of occupational health care lead to cost savings | 2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Quantitative financial data obtained from accounting systems. Qualitative interviews with managers. Document analysis and selection of three cases/person acts.<br><br>*Analysis*<br>Comparison of company's costs against industry | The analysis shows that the company has similar direct occupational health costs compared to the industrial average but its value-based health care approach had a positive effect on the company's profit and loss statement.<br><br>The key to these results lies in the management | |

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| | *Context/setting*<br>Occupational health care within a large international industrial company (Metso Corporation)<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>None. Analysis conducted from a company perspective. | | | average. Analysis of management strategies. Analysis of three cases (persons).<br><br>*Outcomes*<br>Metso Corporation's input costs for occupational health care (expenses for medical treatment and therapy) and output costs (sick leave, insurance costs for injuries, and early retirement contributions) | strategies and governance methods. | |
| Peele P, et al.<br>USA<br>2017<br><br>[58] | *Study design*<br>Prospective longitudinal study<br><br>*Aim*<br>1) to evaluate whether a value-based payment model named High-Value Care for Kids affected total cost of care and related cost outcomes for the managed care organization;<br>2) to assess whether the initiative maintained or improved quality of care for participants<br>3) to conduct a sensitivity analysis to determine what magnitude of savings could be realized under a variety of scenarios.<br><br>*Context*<br>Large integrated health delivery system in Pennsylvania<br><br>*Connection to health care system*<br>Several provisions of the Affordable Care Act (ACA) offer opportunities to test new | Traditional fee-for services (FFSs) reimbursement methods can hinder the delivery of high-value care for children and youth with medically complex conditions. | 2. Measure outcomes and costs for every patient<br>3. Move to bundled payments for care cycles<br>4. Integrate care delivery across separate facilities<br>6. Build an enabling IT-platform | *Data collection*<br>Costs: the organization's claims data. Source of other data not stated.<br><br>*Analysis*<br>Quality and cost outcomes were compared between the intervention group and a comparison group. The groups were matched on age, sex, Charlson Comorbidity Index, baseline total cost of care, number of chronic medical conditions, and number of behavioral health conditions<br><br>A linear mixed model was used for all cost analyses.<br><br>*Outcomes*<br>Four HEDIS measures for children and/or adolescents: access to primary care, annual dental visits, well-child visits in the third, fourth, fifth, and sixth years of life, and adolescent well-care visits. Costs. | Our experiences designing, implementing, and evaluating the High-Value Care for Kids program suggest that real-world laboratories that leverage strong payer-provider partnerships can serve as a useful platform for testing and rapidly scaling value-based payment models with the potential to reduce healthcare costs while maintaining or improving care quality. | |

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| | service delivery and payment models.<br><br>*Participants*<br>Children (n=630) with complex conditions | | | | | |
| Pollock et al.<br>USA<br>2008<br><br>[59] | *Study design*<br>Case report<br><br>*Aim*<br>Not stated. Aim seems to be to describe the application of the Porter model at the MD Anderson Cancer Center<br><br>*Context*<br>University of Texas MD Anderson Cancer Center<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>n.a. | The Porter integrated practice unit is remarkably appealing to health care providers as a genuinely revolutionary concept by which the quality of care can be materially advanced, to benefit patients, regardless of the specific disease for which they seek help. | 1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient<br>4. Integrate care delivery across separate facilities<br>6. Build an enabling IT-platform | *Data collection*<br>No clear data collection.<br><br>*Analysis*<br>No clear analysis<br><br>*Outcomes*<br>No clear outcomes. Data on improvement of outcomes for ovarian cancer since 1970 is presented, comparison of survival rates of nonsmall cell cung cancer between MD Andersson and epidemiological register data are presented and various measures of market share growths. | No conclusion. “The MD Anderson multidisciplinary care center exemplifies the Porter practice unit model”. | Describes changes made from 1991, i.e. before Porter’s introduction of VBHC |
| Ryan et al<br>USA<br>2017<br><br>[60] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To evaluate whether hospital participation in voluntary value-based reforms was associated with greater improvement under Medicare’s Hospital Readmission Reduction Program (HRRP).<br><br>*Context*<br>All acute care hospitals in USA<br><br>*Connection to health care system*<br>Acute care hospitals in the United States are currently | Voluntary participation of a hospital in value-based reforms leads to greater improvements in reducing readmission rates. | 2. Measure outcomes and costs for every patient<br>3. Move to bundled payments for care cycles<br>6. Build an enabling IT-platform | *Data collection*<br>Publicly available national data from Hospital Compare on hospital readmissions for 2837 hospitals from 2008 to 2015<br><br>*Analysis*<br>Interrupted time series design, separate linear fixed-effects models at hospital-year level, sensitivity analysis<br><br>*Outcome*<br>30-day risk standardized readmission rates for acute myocardial infarction (AMI), heart failure, and pneumonia. | We found that participation in one or more Medicare value-based reforms—including the Meaningful Use of Electronic Health Records program, the Accountable Care Organization programs, and the Bundled Payment for Care Initiative—was associated with greater reductions in 30-day risk-standardized readmission rates under the HRRP. Our findings lend support for Medicare’s multipronged strategy to improve hospital quality and value. | |

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| | subject to several value-based reforms.<br><br>*Participants*<br>Patients with acute myocardial infarction (AMI), heart failure, and pneumonia. | | | | | |
| Thaker, et al.<br>USA<br>2017<br><br>[61] | *Study design*<br>Case report<br><br>*Aim*<br>To compare patient-level costs for an MRI-based versus traditional prostate brachytherapy (PBT) workflow using time-driven activity-based costing (TDABC).<br><br>*Context*<br>Radiation oncology<br><br>*Connection to health care system*<br>The Department of Health and Human Services has recently unveiled goals of transforming traditional Medicare fee-for-service payments to quality or value through alternative payment models.<br><br>*Participants*<br>Patients receiving prostate brachytherapy | Understanding provider costs will become important as healthcare reform transitions to value-based purchasing and other alternative payment models. | 2. Measure outcomes and costs for every patient | *Data collection*<br>Not described.<br><br>*Analysis*<br>Not described.<br><br>*Outcomes*<br>Time-driven activity-based costs | TDABC cost was only 1% higher for the MRI-based workflow, and utilization of MRI allowed for cost shifting from other imaging modalities, such as CT and ultrasound, to MRI during the PBT process. | Article entirely based on data collected and reported within previous studies. Only new contribution is the comparison of costs in Fig 5. |
| Van Deen et al<br>USA<br>2017<br><br>[62] | *Study design*<br>Retrospective cohort study<br><br>*Aim*<br>To present the first-year outcomes of a VBHC program for inflammatory bowel disease (IBD) management that focuses on highly coordinated care, task differentiation of providers, | VBHC could bend the cost curve while improving quality. | 1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Extraction of data from an administrative claims database<br><br>*Analysis*<br>Differences in outcomes were compared between UCLA IBD patients and matched control patients. For continuous variables: Wilcoxon-Mann-Whitney test | These are the first results of a successfully implemented VBHC program for IBD. Encouraging trends toward fewer emergency department visits, hospitalizations, and long-term corticosteroid use were observed. These results will need to be confirmed in a larger | "Many institutions are currently adopting components of VBHC in clinical practice. Unfortunately, rigorous scientific reports on outcomes at these approaches are currently lacking" (p331) |

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| | and continuous home monitoring<br><br>*Context*<br>University of California, Los Angeles (UCLA) Center for (VBHC center) versus other academic institutions<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>60 IBD patients from VBHC center and 177 matched controls treated at other academic institutions | | | for comparison of difference-in-differences. For binomial variables: logistic regression<br><br>*Outcomes*<br>IBD-related office visits, ED visits, hospitalizations, procedures, labs, imaging studies and percentage of patients using IBD-related medications between the preindex and postindex year | sample with more follow-up. | |
| van Veghel et al Netherlands 2016<br><br>[63] | *Study design*<br>Prospective longitudinal study<br><br>*Aim*<br>To assess patient-relevant outcomes of delivered cardiovascular care by focusing on disease management as determined by a multidisciplinary Heart Team, to establish and share best practices by comparing outcomes and to embed value-based decision-making to improve quality and efficiency in Dutch heart centres.<br><br>*Context*<br>Heart centres, in-hospital and out-of-hospital follow-up.<br><br>*Connection to health care system*<br>Not mentioned.<br><br>*Participants*<br>Patients who were treated in the 12 participating heart | Determining the costs of cardiovascular care and measuring patient-relevant health outcomes are essential to assess the relationship between the benefits to the patient and the costs incurred per patient and per institution. | 1. Organize into Integrated Practice Units (IPUs)<br>2. Measure outcomes and costs for every patient<br>6. Build an enabling IT-platform | *Data collection*<br>Data on outcomes and QoL for medical treatments collected from the integrated care systems at the participating centres, including both short-term follow-up and a follow-up of 12 months or longer. Data manuals provided to ensure consistency in data collection in all participating centres.<br><br>Mortality data were collected using the electronic database of the regional municipal administration registration.<br><br>*Analysis*<br>Uncorrected and segmented uncorrected percentages of the prevalence for each selected outcome measure were calculated; logistic regression analysis; multivariate Cox proportional hazard analysis; long-term survival graphs | Annual data collection on follow-up of patient-relevant outcomes of cardiovascular care, initiated and organized by physicians, appears feasible. Transparent publication of outcomes drives the improvement of quality within heart centres. The system of using a limited set of patient-relevant outcome measures enables reliable comparisons and exposes the quality of decision-making and the operational process. Transparent communication on outcomes is feasible, safe and cost-effective, and stimulates professional decision-making and disease management. | |

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| | centres between 1 January 2009 and 31 December 2013 for coronary artery bypass grafting (CABG), aortic valve replacement (AVR) or transcatheter aortic valve implantation (TAVI) and between 1 January 2011 and 31 December 2013 for percutaneous coronary intervention (PCI). | | | Heart centres with more than 10% of missing data for an outcome measure were excluded from the analyses for the outcome measure concerned<br><br>*Outcomes*<br>Survival, readmission due to myocardial infarction within 30-days, quality of life, implantation of a new permanent pacemaker within 30 days after TAVI, target vessel revascularization (TVR) rate within 1 year of PCI | | |

ED= emergency department
[1]Value definition (V=outcomes/costs) or individual components:
1. Organize into Integrated Practice Units (IPUs)
2. Measure Outcomes & Costs for every Patient
3. Move to Bundled Payments for Care Cycles
4. Integrate Care Delivery Across Separate Facilities
5. Expand Excellent Services Across Geography
6. Build an Enabling IT-platform