



Centres of Excellence in Health and Disability Service Delivery

Evidence brief

Office of the Chief Science Advisor
2023

This document is an evidence brief and as such, the findings do not reflect government policy. It is intended as background to support health agencies' further work.

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Executive summary

Background and context

Centres of excellence (CoEs) are often established to fill a gap in existing services for a specific condition, such as a rare disorder or conditions requiring high levels of interdisciplinary expertise and integration of multi-disciplinary care. Establishing a CoE requires strategic planning; the literature provides guidance on the essential foundations and operational elements for sustainability and meeting continuing standards of excellence. Internationally, CoEs focused on one speciality, condition or medical need have been established for several decades; many of these conduct research and evaluation alongside interdisciplinary and ongoing health care.

Scope of the brief

A rapid scoping review was undertaken to gather national and international evidence of the effectiveness and impact of CoEs in a health and disability context. The review included a scan of Aotearoa New Zealand examples of comparable services to provide additional insight into the relevance of CoEs for the Aotearoa New Zealand context.

Key findings

Effectiveness and impact

In the nine studies which evaluated a CoE, there was a consistent limitation in the findings related to the type of data collected by the CoEs. Missing or absent data has prevented accurate evaluation and research. There was evidence that enrolment in a CoE had made significant impacts on disease severity and cost per person in national cohort studies for rheumatoid arthritis, type 2 diabetes and Parkinson's disease. Standardised care pathways and timely access to specialists were found to be more likely to result in effective person-centred care.

Workforce

Enabling equitable access to specialised medical knowledge and multi-disciplinary treatment expertise was identified as a way in which CoEs had a point of difference from standard health care provision. Two studies identified that this access was a key factor for improved outcomes and the management of co-morbidities that are often major influencing factors in health outcomes.

Insights from Aotearoa New Zealand specialised centres

There were several examples of specialised services with a history of innovation and longevity having been set up several decades ago. These centres are not standardised, and all were community-initiated, to fill in gaps in public services. Most of the services were focused on delivery of treatment and support for people and families. However, some did provide clinical guidance and training for professionals through accreditation and practice standards. Community leadership, strong public funding partnerships and the ability to quickly respond to health and disability system changes were common features of all the services. Research activity, evaluations and clinical outcomes were less commonly reported.

Introduction

Complex medical, disabling or rare conditions require specialist knowledge, skills and access to best practice evidence-based treatments. To meet this need, services in overseas settings have emerged, termed 'centres of excellence' (CoEs) for a specific specialised health or disabling condition. These centres provide niche specialist services and comprehensive, evidence-based interdisciplinary care alongside ongoing research and evaluation. The primary aim of the combined teams within CoEs is to inform clinical knowledge, practitioner skills and innovative practices (Elrod and Fortenberry 2017; Manyazewal 2022). Currently there do not appear to be any services in Aotearoa New Zealand using the term CoE as a descriptor or title. A rapid scoping review was undertaken to gather insights into the effectiveness and impact of CoEs as an approach to complex health care. The review included a scan of Aotearoa New Zealand examples of comparable centres to provide additional insight into the relevance for the local context.

Methodology

A scoping review includes a wide range of sources to identify, characterise and summarise evidence on a topic, including identification of research gaps. Our rapid scoping review followed methodological guidelines for scoping reviews in the *JBI Manual for Evidence Synthesis* (Peters et al 2020). A senior librarian at the Ministry of Health completed a literature search of peer reviewed publications from 2013–2023. The search employed a range of search terms describing specialised centres in combination with the terms evaluation; effectiveness; impact; performance; audit or monitoring. We completed a manual grey literature search to identify Aotearoa New Zealand centres which provided services similar to those searched for in the literature search to use as comparative case studies. Appendix 1 sets out the search terms and strategy including inclusion and exclusion criteria.

Results

Our scoping review identified nine publications evaluating the effectiveness and impact of CoEs. These covered spinal surgery (three), rheumatology (four), diabetes (one) and Parkinson's disease (one). One publication was a systematic review of spine CoEs (Martin 2022). The other spine and diabetes CoEs were located in the United States, the rheumatology CoEs were in Australia and Colombia and the Parkinson's disease CoEs were in the United States, Israel, Canada and the Netherlands. The methodologies deployed were generally retrospective observational case reviews or studies that compared administrative data held by CoEs with nationally held data from traditional health care settings or a historical cohort. Two of the nine studies carried out cost analysis (Ghobrial 2020; Santos-Moreno et al 2021), and the remaining six were focused on health outcomes (Mehrotra et al 2013; Grosman et al 2023; Santos-Moreno et al 2018; Santos-Moreno et al 2022; Thomas et al 2021; Zeldenrust et al 2020). In addition to these research studies, there was one systematic scoping review which synthesised 78 studies related to CoEs (Manyazewal et al 2022) and a detailed description of key success factors for developing a successful high-quality CoE (Elrod and Fortenberry 2017).

We did not formally assess the quality of the studies. However, our summary of evidence (see Appendix 3) presents limitations and key recommendations from each. We identified five Aotearoa New Zealand health or disability services that met the inclusion criteria and had enough publicly available information to analyse. We created an analytical framework to compare these services with the essential components of a CoE described in the literature search; Appendix 4 presents this in a summary of evidence table.

Findings

The evidence from the two scoping strategies has been synthesised into three main themes:

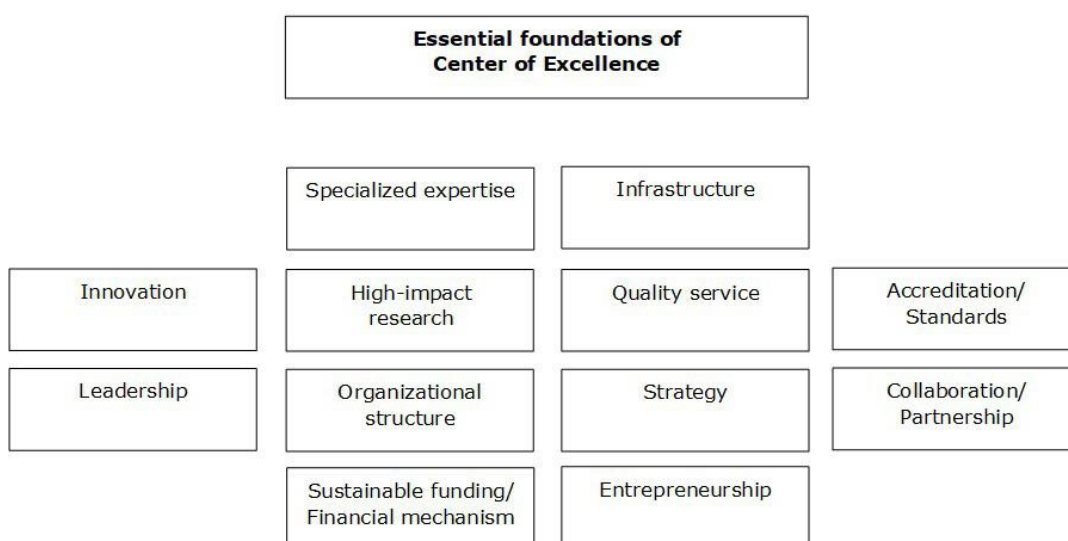
1. What is a CoE?
2. Effectiveness and impact
3. Insights from Aotearoa New Zealand specialised centres

What is a CoE?

The concept of CoEs has been gaining popularity as a way to address the lack of standardisation in service delivery. Clinical leadership forums in speciality areas such as the European Neuroendocrine Tumour Society (European Neuroendocrine Tumor Society 2023) and the Parkinson's Foundation Global Care Network (Parkinson's Foundation 2023) have recently implemented programmes for international accreditation and endorsement as a CoE for members. In Austria, the status of a CoE is decided by federal health care authorities as a strategy to avoid duplication of services and support the creation of a network of high-quality institutions (Laimer et al 2017). In the United States of America, CoEs have been in existence since the 1980s as a response to the market-driven and highly competitive health care funding model (Elrod and Fortenberry 2017). There are however, no internationally recognised standards, criteria or accreditation pathways for designation for a centre to be considered 'excellent', and the title is often used as part of branding or promotion of a service (Elrod and Fortenberry 2017).

To develop some conceptual guidance towards what a CoE should provide, Manyazewal et al (2022) undertook a large synthesis of 78 studies that defined, theorised, implemented or evaluated a CoE. They consequently distilled 12 essential foundations of a CoE, as Figure 1 shows.

Figure 1: Essential foundations of a centre of excellence



A detailed description of how the Willis-Knighton Health System, a non-governmental, not-for-profit health care provider, has developed the concept of a CoE to become one of the (self-professed) market leaders for quality health care in the United States provides an organisational perspective on what makes a successful CoE (Elrod and Fortenberry 2017). In the 1980s, Willis-Knighton began establishing CoEs as a delivery model; by 2017 it operated 11 CoEs.¹ The organisation credits the model for its current market leadership position in the United States. Willis-Knighton has identified six key establishment components for setting up a CoE: organisation design, service-scape design, personnel, medical care, marketing and finance (Appendix 2). It considers that these components distinguish a CoE from a traditional health care delivery model, as synergies between the components support a much higher quality of care. Willis-Knighton also suggests that the depth and breadth of services available through such CoEs fill gaps in existing systems, where otherwise communities simply have to do without (Elrod and Fortenberry 2017). The CoE concept is being implemented outside the United States health system; there are examples of successful expansion and increasing functions and coverage for target populations.

The European Organisation for Rare Diseases (EURORDIS) has strongly advocated development of CoEs across the European Union. The European Union is able to facilitate sharing and delivering specialist expertise across diverse health systems and national funding models within the European Union for rare disorders (EURORDIS 2016). One example of this is the epidermolysis bullosa (EB) House Austria. Originally established for EB only in 2005, this specialised service has grown from a small national clinic to act as a European Union and international centre of expertise for the EB family of rare disorders called genodermatoses.² By 2017, EB House Austria provided an outpatient clinic, research unit, academy and clinical study centre (Prodingler et al 2020).

¹ These were for cancer, orthopaedics, reproductive medicine, women's and children's health, regional transplant centre, laparoscopic and robotic surgery, stroke, eye care, heart and vascular and rehabilitation.

² Genodermatoses are inherited multisystem disorders characterised by prominent cutaneous manifestation.

Effectiveness and impact

In the nine studies which evaluated a CoE, there was a consistent limitation in the findings related to the type of data collected by the CoEs. Missing or absent data prevented accurate evaluation and research about the effectiveness and impact of the centre. Metrics were not routinely collected about variables such as functional and lived experience outcomes, multi-disciplinary team input, catchment areas, the presence of competing services or comprehensive costing data. These limitations impeded meaningful evidence of the CoEs' effectiveness and impact (Martin et al 2022; Ghobrial et al 2020; Mehrotra et al 2013; Grosman et al 2023; Santos-Moreno et al 2018). The absence of metrics such as adverse treatment events, treatment adherence, complications from an intervention and time before additional specialised intervention is required were also important limitations highlighted in the studies including cost analyses (Santos-Moreno et al 2021; Mehrotra et al 2013).

The other limitation was that the CoEs were not comparable because of non-standard services and components of the centres, even if they were providing specialist services for the same target population. The systematic review of the features of spinal CoEs and the impact these had on patient satisfaction and outcomes found that distinguishing features of a CoE were absent in some centres (Martin et al 2022). A similar finding was made in an evaluation of 19 CoEs providing care for people with Parkinson's disease across four different jurisdictions (Zeldenrust et al 2020). Despite all the CoEs meeting the same endorsement criteria, set by the Parkinson Foundation, the number of hospital contacts (admissions or outpatient) between cases managed by each CoE were highly variable. The authors suggested that a closer examination of practices between CoEs, especially those reporting lower rates of tertiary care required, would provide insight into the institutional factors influencing this (Zeldenrust et al 2020). Likely because of the limitations noted above, there was little evidence to show that spinal surgery CoEs made any impact on either cost, calculated by length of stay and cost per procedure (Ghobrial et al 2020) or health outcomes, assessed by the number of complications and quality of life/lived experience (Martin et al 2022; Mehrotra et al 2013).

There was evidence, however, that enrolment in a CoE had made significant impacts on disease severity and cost per person in CoEs for rheumatoid arthritis (Grosman et al 2023; Santos-Moreno et al 2018; Santos-Moreno et al 2022), type 2 diabetes (Thomas et al 2021) and Parkinson's disease (Zeldenrust et al 2020). Three of these studies focused on access to treatment (Grosman et al 2023; Santos-Moreno et al 2022; Thomas et al 2021) and two on the reduction in costs of the health care required (Santos-Moreno et al 2021; Zeldenrust et al 2020).

Several studies found that standardised care pathways were more likely to result in effective person-centred care. Specific care pathways for rheumatoid arthritis and type 2 diabetes, when strictly adhered to by the CoE disciplines, resulted in timely access to specialist appointments. These in turn facilitated appropriate evidence-based diagnostic and responsive treatment regimens (Santos-Moreno et al 2018; Santos-Moreno et al 2022; Thomas et al 2021). The large national longitudinal study of 7,053 CoE-enrolled rheumatology patients found a statistically significant reduction in severe disease progression. There was less consumption of other resources, such as additional appointments with specialist staff, and a reduction in prescription of the costliest

medications (Santos-Moreno et al 2018). An important aspect attributed to this success was having the staffing and expertise available to directly inform the day-to-day practice of the multi-disciplinary team in ways that were tailored for each person's need. A key part of this successful practice was enabling access to specialists: this had a positive impact on adherence to treatment regimens due to the perception of quality combined with culturally safe care. In an Australian rheumatology centre, Grosman et al (2023) found that a marked increase in adherence to treatment and attendance to appointments among Aboriginal and Torres Strait Islanders was due to the perception of the safety and quality of care received rather than locality or convenience to the service user.

Workforce

Managing workforce shortages and equitable access to specialised medical knowledge and multi-disciplinary treatment expertise was identified as a way in which CoEs had a point of difference from standard health care provision. Two of the studies raised this as a key factor for improved outcomes for the target condition as well as for the management of co-morbidities that are often major influencing factors in health outcomes (Santos-Moreno et al 2022; Thomas et al 2021). Specialised navigator roles, where a dedicated team member is trained to support people and families manage and 'navigate' their way through services and interventions, were highlighted as a key element in the successful management of complex co-existing medical needs in people with type 2 diabetes (Thomas et al 2021). Another strategy to enable access to specialist workforces has been established in the European Union: European reference networks, set up in parallel with the drive to establish CoEs. These virtual networks aim to facilitate discussion, knowledge sharing and clinical management of complex or rare diseases and conditions across 26 European Union member states, to improve access to specialist workforces (European Commission 2023b). An evaluation of the performance and outcomes of establishing these networks is currently being undertaken (European Commission 2023a).

Insights from Aotearoa New Zealand specialised centres

Our rapid scan of a variety of specialised services identified the Burwood Spinal Unit; the Champion Centre (early childhood development); TalkLink, a nationwide assistive technology and communication service; the Blind and Low Vision Education Network (BLENNZ) and QE Health, a centre for rheumatology and immune disorders, as services which focused on niche specialist and complex health or disability services. These services showed a history of innovation and longevity, and all had been in existence since at least the 1970s. Appendix 4 provides a summary of these histories and the services provided. These services each had alignment with many of the 12 essential foundations of a CoE identified by Manyazewal et al (2022), as summarised below. However, we found little standardisation between the services in this regard.

Specialised expertise

All the services provided large multi-disciplinary and cross-sectorial expertise for the target population. Speciality services appeared to have developed over time and in conjunction with local resources. For example QE Health in Rotorua was built around the therapeutic properties of the geo-thermal water found in this region; the BLENNZ service had built up specialised knowledge from providing residential schooling for blind and vision-impaired children for many years; TalkLink had continued to expand as technology and the digital capability of devices had increased, as well as with the development of the workforce of speech-language therapists who could speak te reo Māori; and the Champion Centre employed a range of specialists trained to work in early education settings. All the centres had access to specialist medical and surgical expertise in partnership with both public and private providers.

Collaboration and partnership

All the services assessed had established significant community partnerships and collaborations. Most were initially established by a committed individual or community group to fill a gap in health or disability services. Community partnerships and/or governance were key parts of the structures. Historically, the services had evolved, reconfigured and developed their services over time in response to community need, and for sustainability. As examples, community-governed QE Health opened a \$4 million purpose-built facility in 2023 to meet demand; the nation-wide community-based BLENNZ service combined with Homai Residential School in 2005 to provide one consolidated national service; and TalkLink has proactively developed and resourced digital technologies in partnership with industry to provide assistive speech in te reo Māori.

The services had developed various collaborations or partnerships with the public health system. For example, the spinal, rheumatology and blind-low vision centres had been closely connected to the public health system since their inception, due to the need to access surgical and specialised medical expertise, whereas TalkLink and the Champion Centre were less reliant on medical specialists and more connected with therapists and allied health staff working within publicly funded services, including Whaikaha – Ministry of Disabled People, ACC and Health New Zealand – Te Whatu Ora.

Quality service, accreditation standards

Most of the services were focused on delivery of treatment and support to people and families; however, BLENNZ and TalkLink provided clinical guidance and training for professionals through accreditation and practice standards (TalkLink Trust 2022; Blind and Low Vision Education Network NZ 2023). These included clinical guidelines and resources, accredited professional training for endorsement as a specialist, formal supervision, coaching and mentoring.

Research activity

Research and evaluation activity was less reported in the public domain. The Burwood Spinal Unit and Champion Centre had research partnerships with New Zealand universities and overseas institutes (Te Whatu Ora Canterbury 2023; Christchurch Early Intervention Trust 2019). The Burwood Spinal Unit has an associated research academy and maintains the New Zealand Spinal Cord Injury Registry to support evaluation of services and health outcomes. The other services included in this analysis may be involved in similar activities, but at the time of writing these were not identified.

Sustainable funding

All of the centres relied on government funding (from the Ministry of Health, Ministry of Education, Whaikaha and ACC) for financial viability but also undertook fundraising and other revenue-gathering activities to address funding shortfalls. BLENNZ and the Champion Centre are funded predominantly by the Ministry of Education but provide essential specialist child development services for children and young people with often complex health or disability-related needs. TalkLink is an independent national non-government organisation which has grown independently in parallel with technological advancements in assistive communication technologies. While it is jointly funded, it is more aligned with Whaikaha, and aims to meet the social aspirations and self-determination needs of disabled people through a social model of disability.

Limitations

This evidence brief was undertaken in a short time frame and kept the inclusion criteria tightly adhered to, to manage the numbers of articles it was possible to review. Our literature search did not identify any studies on the effectiveness or impact of CoEs originating from the European Union, despite significant work referring to CoEs noted.³ We located only literature that originated in the United States, Colombia, Australia or an international consortium.

Conclusion

Evidence examining the effectiveness of 'centre of excellence' or 'co-ordination hub' approaches for the management of specialised health or disability needs is limited; research is still emerging. The concept of a CoE is being taken as a strategic approach in some specialised areas of health and disability to facilitate international research collaboration and access to clinical expertise. CoEs are being utilised as a 'brand' or quality marker to provide standardisation in the context of evidenced-based responsive care pathways. There was emerging evidence that well-managed CoEs are able to deliver better health outcomes for complex conditions. In Aotearoa New Zealand, there are some comparable specialised services. In the five services we analysed, we found alignments to the CoE concept. Community leadership, strong public funding partnerships and the ability to quickly respond to health and disability system changes were a visible strength in all of these services.

³ The search strategy had an exclusion of non-English language publications which may have been a factor in this result.

Appendix 1. Scoping review methodology

Using the population, concept and context (PCC) criteria detailed in the JBI Manual for Evidence Synthesis (Peters et al 2020), we developed the following question:

What is the evidence of the effectiveness of 'centre of excellence' or 'coordination hub' approaches for health or disability systems to deliver equitable health outcomes for populations with specialised health and/or disability needs?

Inclusion criteria:

- peer reviewed literature
- English language
- in last 10 years (2013–2023)

Exclusion criteria:

- clinical guidelines, standards or regulations
- opinion, theory or commentary
- letters to editor
- frameworks, funding pathways or policy
- annual reports or contractual reporting

Initial search strategy (8 November 2023)

Care pathway; multi-disciplinary centre; Center of expertise; expert team; specialist treatment centre; centre of excellence; specialist community service; research centre; hub

+

Evaluation; effectiveness; impact; performance; audit; monitoring.

+

Complex health and disability; long-term conditions; rare diseases; specialised treatment.

A senior librarian at the Ministry of Health completed a literature search using the following key terms: care pathway, multi-disciplinary centre, centre of expertise, expert team, specialist treatment centre, centre of excellence, specialist community service, research centre, hub, evaluation, effectiveness, impact, performance, audit, monitoring, complex health and disability, long-term conditions, rare diseases and specialised treatment.

We reviewed additional literature from citing literature and reference lists from sources. We purposively sought grey literature from Aotearoa New Zealand specialised centres to compare with this published literature. This search was informed by subject-matter

experts and a manual review of websites for suggested specialised centres. We included centres that met the inclusion criteria and had enough information to compare alongside the 12 CoE essential foundations identified in Manyazewal et al's (2022) systematic review for analysis.

Appendix 2. Willis-Knighton Health System Centre of Excellence Establishment Protocol

A systematic approach to establishing a Centre of Excellence (Elrod and Fortenberry 2017).

<p>Stage 1: vision and validation</p> <p><i>When considering the establishment of a center of excellence, conduct a series of initial assessments to conceptualize the offering and ascertain feasibility</i></p> <ul style="list-style-type: none"> a. Appoint an interdisciplinary committee charged with envisioning the prospective center of excellence b. Assess the availability of foundational requirements for success by verifying the sufficiency of financial resources, organizational culture, and leadership support c. Craft working mission and vision statements for the prospective center of excellence d. Conduct a feasibility study to assess community need, determine services to be featured, estimate patient volume, and ascertain the financial viability of the proposed center
<p>Stage 2: design and development</p> <p><i>With conceptualization completed and feasibility verified, prepare detailed plans which address each component of the center of excellence</i></p> <ul style="list-style-type: none"> a. Organization design <ul style="list-style-type: none"> i. Prepare a comprehensive organizational chart which depicts positions and associated reporting relationships required for comprehensive, single-site treatment of targeted medical conditions ii. Devise shared governance mechanisms and processes to ensure transparency and accountability b. Servicescape design <ul style="list-style-type: none"> i. Aided by field trips to peer centers, insights from internal and external experts, and accounts in publications, design a service environment customized to address the needs of patients facing the medical conditions targeted by the proposed center ii. Determine the assets to be housed within the given centre, the anticipated patient volume, the accommodations required by staff members, and the associated spatial requirements necessary to deliver the entire continuum of care within the servicescape

iii.	Identify an appropriate site to house the center of excellence and work with architects, engineers, designers, and other professionals to prepare formal plans
c.	Personnel
i.	Determine staffing requirements and the specific qualifications (e.g., credentials, skills, experience) needed to fulfil the centre’s mission
ii.	Formulate an associated recruitment plan to acquire highly qualified personnel
d.	Medical care
i.	Formulate plans to ensure that servicescape and workforce assets are carefully integrated via the organization design to yield outstanding medical care and attention
ii.	Incorporate organizational learning principles to facilitate best practices, continuous improvement, and innovation
iii.	Envision which areas outside of the centre’s command and control patients likely will encounter so that relationships can be formed to facilitate the delivery of excellence across the entire patient experience
e.	Marketing
i.	Select the centre’s brand name, design brand elements (e.g., logos, slogans), and formulate an associated marketing communications plan and, ideally, a center-specific marketing plan
ii.	Envision potential opportunities to cross-sell services to patients
f.	Finance
i.	Investigate opportunities to maximize efficiencies and bolster reimbursements and work to incorporate these into clinical and administrative processes to enhance revenue
ii.	Ensure that synergies between and among the distinguishing features of the center are maximized to afford enhanced financial performance
Stage 3: completion and commercialization	
<i>On approval of design and development plans, the center of excellence moves from the blueprint stage to construction and then launch, concluding the establishment protocol</i>	

Appendix 3. Summary of evidence – centres of excellence

Study	CoE	Population	Methodology	Results	Key findings
Spine					
Ghobrial et al 2020 United States	<p>A spine-centred care pathway at a regional academic spine centre</p> <p>A 24-bed dedicated spine unit was created to centralise care of spine patients and to optimise patient care by designating a specialised team of nurses, physical therapists, occupational therapists and hospitalists, all familiar with the designated pathways as well as the care of spinal patients.</p>	<p>Postoperative spinal surgery patients</p> <p>2014–2015</p>	<p>Retrospective case review and cost analysis to assess the impact of standardised spine care on inpatient elective and non-elective spine admissions and the impact on overall hospital costs and length of stay.</p> <p>Four time periods were compared: historical control, initial pathway implementation, full pathway implementation and spine unit opening.</p> <p>Mean hospital length of stay, mean and median total costs and the ratio of costs to charges were analysed.</p>	<p>The mean overall hospital Length of stay varied from 3.8 to 4.3 days for all diagnosis related groups across the time periods and did not reach statistical significance.</p> <p>The median variable cost per procedure declined after the spinal care pathway and dedicated spinal unit were implemented but did not reach statistical significance.</p>	<p>Lack of necessary data prevents the analysis needed to demonstrate reduction in length of stay and total costs or ratio of cost-to-charges.</p> <p>Future studies should correlate functional outcomes measures with the implementation of this spine service.</p> <p>Further study is required to determine the relative impact of specific care initiatives on postoperative outcomes and reduction of procedural morbidity.</p>

Study	CoE	Population	Methodology	Results	Key findings
Martin et al 2022	Spine COEs at tertiary care centres	Adult and child in-patients	<p>Quantitative systematic review looking at features of CoEs and how they impact patient satisfaction and outcomes.</p> <p>Publication from inception through September 2021.</p> <p>The literature search found 567 unique publications. Of these articles, 20 were included.</p>	<p>Quantitative comparisons of CoE versus non-CoE had contradicting findings when comparing complication rates and episodic costs.</p> <p>Qualitative data included descriptions of spine CoE features and cited improved patient care, technical advancements and individualised care paths as positive aspects of the CoE model.</p> <p>The mean risk of bias assessment was 3.67 (fair quality).</p>	<p>Spine CoEs showed no significant, empirical improvements in patient outcomes, but there were serious limitations to the findings of the studies.</p> <p>Improvement in the patient experience is often lacking as a metric, as well as access to specialty care, preoperative evaluation and effective postoperative coordination with multiple teams upon discharge.</p> <p>Effective preoperative evaluation potentially involves evaluation by multiple teams, which can be more efficient in a centre with a standardised pathway.</p> <p>The procedural outcomes measured did not address the variation in and definition of CoEs.</p> <p>A key metric that can be used to evaluate the effectiveness of spinal CoEs is cost-effectiveness, but this metric was minimally included in the studies.</p>

Study	CoE	Population	Methodology	Results	Key findings
<p>Mehrotra et al 2013</p> <p>United States</p>	<p>Hospitals designated as spine surgery centres of excellence</p>	<p>Individuals aged 18–64 with one of three types of spine surgery.</p> <p>2007–2009</p>	<p>Evaluation of Medicare Hospital</p> <p>Comparison between administrative data</p> <p>No methodology stated</p> <p>The purpose of the study was to compare the outcomes and costs for selected types of spine surgery at 369 hospitals designated as CoEs to 1,449 other hospitals without this designation.</p> <p>The primary outcomes were any complication (seven complications were captured) and 30-day readmission. The multivariate models controlled for differences in age, gender and comorbidities between the two sets of hospitals.</p>	<p>A total of 29,295 cervical simple fusions, 27,214 lumbar simple fusions and 28,911 lumbar discectomy/decompressions were identified, of which 42%, 42% and 47% respectively were performed at a hospital designated as a spine surgery CoE.</p> <p>Designated hospitals had a larger number of beds and were more likely to be an academic centre.</p> <p>Across the three types of spine surgery, there was no difference in the composite complication rate or readmission rate at designated hospitals compared to other hospitals.</p>	<p>The time period of the data collection was before the hospitals were actually designated as CoEs (2009–2010).</p> <p>Given what can be accurately captured via analysis of claims, the study did not look at several spine-specific complications (eg, nerve root injury, dural tear) or functional outcomes (eg, whether patients at designated hospitals had greater improvements in pain).</p> <p>The impact on functional outcomes is important because that is typically why patients have surgery.</p> <p>A related point is that given only three years of data were available, the study was unable to assess another possible outcome: mean time to re-operation.</p> <p>Future analyses might consider adding stroke as another outcome for cervical spine surgery.</p>

Study	CoE	Population	Methodology	Results	Key findings
					The results emphasise the need to empirically evaluate whether CoE programs successfully identify hospitals with improved patient outcomes and lower costs of care.
Rheumatology					
Grosman et al 2023 Australia	The Southern Queensland Centre of Excellence in Aboriginal and Torres Strait Islander Primary Health Care The CoE integrates primary and secondary care through the provision of specialty clinics; referrals are generated internally by the centre's regular general practitioners.	93 people, 86% of whom were urban Aboriginal or Torres Strait Islanders and 62% of whom were female, with a mean age of 54 years. 2016–2020	Retrospective observational study of administrative data Clinical records at the CoE were compared to administrative attendance data from the largest public general rheumatology clinic in the region for the four years preceding the establishment of the CoE clinic as a historic cohort control.	Of the appointments studied, 75% were attended at the CoE versus 71% at Princess Alexandra Hospital. The absolute number of episodes of care in the monthly CoE clinic was 439 episodes, compared with 207 in the historical comparison. Geographic distance was not a predictor of clinic attendance.	Engagement with clinical staff and perceived quality of care were more important to patients than factors of convenience, such as travel. The absence of a well-defined catchment area for the clinic and the presence of other public and private rheumatology services meant the study could not make any estimates about disease prevalence or incidence of the conditions described.
Santos-Moreno et al 2018 Colombia	The CoE initiative for rheumatoid arthritis was proposed by the Pan-American League of Associations for Rheumatology due to deficiencies in health care systems. The health care model is based on an adaptation of the Colombian Clinical	968 patients, 80.2% of whom were women, with a median age of 64 years. 2015–2016 In 2015, mandatory reporting of demographic and clinical data of patients with rheumatoid arthritis to the High-Cost Disease Fund of Colombia was required.	Prospective observational cohort study The aim of the study was to assess the effectiveness of a CoE by following a cohort of rheumatoid arthritis patients receiving synthetic disease-modifying antirheumatic drugs from the baseline up to for 24 months.	At baseline, 41% of patients were in remission, 17% in low disease activity and 42% in moderate disease activity or severe disease activity. At 24 months of follow-up, 66% were in remission, 18% in low disease activity and only 16% in moderate or severe disease activity.	Health outcomes changed because of the application of a CoE model of patient-centred care for management of rheumatoid arthritis. Improvement of patients prevented them from progressing to more serious stages of the disease, at which treatments were more expensive in pharmacological

Study	CoE	Population	Methodology	Results	Key findings
	Practice Guideline for the management of rheumatoid arthritis. Under this model, patients with a diagnosis of rheumatoid arthritis are treated with synthetic disease-modifying antirheumatic drugs and followed up by a rheumatologist at least six times per year and by other allied professionals at least three times per year.	There were roughly 72,000 patients with rheumatoid arthritis in Colombia in 2015–2016.	CoE patients were followed up during the 24 months using a treat-to-target strategy with a patient-centred care model, involving a patient being seen by a rheumatologist, physical and occupational therapist, physiatrist, nutritionist and psychologist at least three times a year according to disease activity by DAS28 (a measure of disease activity in rheumatoid arthritis: 'DAS' stands for 'disease activity score'). Otherwise, patients received standard therapy.	Regarding DAS28, the mean at the beginning of the time analysis was 3.1 (SD 1.0) and after 24 months it was 2.4 (SD 0.7), showing a statistically significant improvement ($p < 0.001$). In all patients, the reduction of disease activity was 65%.	terms and there was more consumption of resources such as doctor's appointments and hospitalisations. People with worse health incur higher indirect costs related to loss of productivity, especially if they have a disease that leads to a greater extent of disability, such as rheumatoid arthritis. There was difficulty calculating the specific weight of each specialty involved in health care for the improvement of the patients. The study considered that rheumatology appointments and the strict application of the treat-to-target strategy by themselves would have contributed 60–70% of that improvement.
Santos-Moreno et al 2021 Colombia	As per 2018 study	As per 2018 study	Cost description analysis using the standard costing technique: estimating the costs of medical consultations, laboratories, images and medications for rheumatoid arthritis, and evaluating the cost impact of providing rheumatoid arthritis clinical care for a	Expenditure on therapeutic drugs increases as the severity of rheumatoid arthritis increases. Drugs represent 53.6% of the total cost for the low disease activity stage, 75.2% for moderate disease activity, 88.5% for severe disease activity and 97% for severe	Comprehensive cared based on the treat-to-target strategy is a way to lower health expenditure. Increasing the number of patients in remission and with low disease activity (to less expensive severity levels), while reducing the number of patients with moderate and severe activity, would lead to a considerable

Study	CoE	Population	Methodology	Results	Key findings
			previously described cohort using the CoE approach	<p>disease activity with biologic treatment.</p> <p>Treating 968 patients would cost US\$612,639 (US\$487,978–1,220,160) at baseline per year. After a year of follow-up at the CoE, treating the same patients would cost US\$388,765 (US\$321,710–708,476), which implies potential cost savings of up to US\$223,874 per year.</p> <p>The strategy of providing clinical care for rheumatoid arthritis through CoE could save US\$231.30 per patient per year.</p> <p>These savings are equivalent to 87.4% of the monthly minimum wage in Colombia in 2018.</p>	<p>reduction in costs for third-party payers.</p> <p>The CoE model guarantees a higher frequency of consultations with a rheumatologist, provides the attention of a multi-disciplinary team and assures strict follow-up in terms of laboratories and imaging tests.</p> <p>Standard costing, which considered cost of treatment and regulated follow-up of the disease, did not consider aspects such as treatment adherence and was unable to account for variability among patients.</p> <p>Another limitation of the study was that it did not consider the costs of adverse effects of treatment.</p>
Santos-Moreno et al 2022 Colombia	A CoE in rheumatology using a comprehensive care model of multi-disciplinary care for rheumatoid arthritis: 1) designing an educational programme to involve the patient as part of the care process	Adults (≥18 years) with a confirmed clinical diagnosis of rheumatoid arthritis defined by a rheumatologist 2018–2019 7,053 patients were treated at the CoE.	A real-world comparative study (retrospective cohort study) based on an analysis of the electronic health records of a cohort of rheumatoid arthritis patients managed with the 'treat-to-target' strategy in a specialised rheumatology	<p>In the specialised CoE, 70% of patients received between four and six rheumatology visits per year, while the national registry reported three or fewer visits per year.</p> <p>A 56% remission status was achieved at the specialised</p>	<p>Specialised centres can access an information system that allows the capture of critical variables and standardised protocols for using validated composite measures.</p> <p>This allows analysis of the cohort behaviour to evaluate</p>

Study	CoE	Population	Methodology	Results	Key findings
	<p>2) driving efforts to prevent complications and avoid disability, reducing costs</p> <p>3) ensuring regular interdisciplinary care to determine disease progression and impact by rheumatologists, psychologists, nutritionists, physical and rehabilitation therapists, occupational therapists, physiotherapists, nurses and pharmaceutical chemists</p> <p>4) assessing compliance with pharmacological and non-pharmacological treatment to verify patients' adherence to the medication</p> <p>5) implementing risk management strategies that must be cost-effective in achieving therapeutic goals.</p>	<p>At that time there were 81,492 patients on the National Registry of Rheumatoid Arthritis.</p>	<p>centre in Colombia with a multi-disciplinary care model, compared with the National Registry of Rheumatoid Arthritis, which includes different models of usual care.</p>	<p>centre, and 31.1% at the national level ($p < 0.001$).</p> <p>A higher proportion of conventional therapy drug use was evident in the specialised centre cohort; there were no significant differences with the national registry in terms of the use of biological disease-modifying antirheumatic drugs (except for Certolizumab).</p> <p>Greater access to rheumatologist care, laboratory studies and radiographic images occurred in the specialised CoE.</p>	<p>the treatment in place, make better therapeutic decisions and check research hypotheses in response to the needs of the patients.</p> <p>The findings show the benefit of greater access to rheumatologist care, laboratory studies and the radiographic images necessary for diagnosing and following the disease in the specialised CoE. These results are similar to those in other reports that have identified that patients receiving this type of care experience fewer barriers to access to specialised health care compared to patients in conventional programmes.</p> <p>A more targeted use of pharmacological interventions occurred in specialised CoEs due to more accurate patient selection for more advanced therapies.</p> <p>Timely rheumatological care allows the linking of new patients to specialised care models. As an outcome, these individuals have fewer</p>

Study	CoE	Population	Methodology	Results	Key findings
					<p>complications and receive earlier and more effective treatments that inhibit the progression of the disease and the need for surgical interventions for joint damage.</p> <p>The reduced number of consultations in the national registry may reflect the growing burden of rheumatoid arthritis on the supply of rheumatology services and the geographic gaps that limit care. Another advantage that specialised centres have is the availability of rheumatologists, greatly needed in Colombia. Specialised CoEs performed more clinical tests because they adhered to updated clinical practice guidelines. Specialised CoEs also used multi-disciplinary models in providing care for patients with rheumatoid arthritis, guaranteeing the management of comorbidities such as arterial hypertension and osteoporosis (the most frequent comorbidities related to rheumatoid arthritis in the registry)</p>

Study	CoE	Population	Methodology	Results	Key findings
Type 2 diabetes					
Thomas et al 2021 United States (Kansas City)	The Haverty Cardiometabolic Center of Excellence, Saint Luke's Mid America Heart Institute The centre implements a collaborative model of care focused on aggressive and comprehensive secondary cardiovascular risk reduction in patients with type 2 diabetes and cardiovascular disease from a multi-disciplinary team of endocrinologists, primary care physicians, nurse navigators, a nephrologist, a diabetes educator, a dietitian and pharmacists	130 people with type 2 diabetes and cardiovascular disease who had at least one follow-up visit at the CoE and 3,149 patients with at least one follow-up visit in conventional care settings during the same timeframe 2018 A registry was developed to track patient outcomes, to provide evidence that this model of care delivery improves better outcomes as compared to standard management.	Statistical multi-variate data analysis Outcomes were evaluated by comparing patients followed in the centre to a matched cohort of patients with cardiovascular disease and type 2 diabetes treated in other care settings (primary care, general cardiology) within the same health care system. Implementation success was determined by assessing adoption of guideline-directed medical treatment and improvement of cardiovascular disease risk factors.	Based on the propensity-matched, modified Poisson models, at follow-up, collaborative-model-of-care patients had a higher rate of guideline-directed medical treatment. In the propensity-matched linear regression models, collaborative-model-of-care patients had a greater reduction in weight and total daily insulin dose compared with the control group.	Early results showed significantly greater improvement in terms of cardiovascular risk and higher rates of guideline-directed medical treatment. This delivery model is replicable, scalable and implementable in other health systems. The navigator role is essential for the model; effective education can be provided to nurses so that they can adapt their current skillsets to take on these duties. There is an opportunity for other clinicians such as pharmacists and certified diabetes educators to fulfil the navigator role.
Parkinson's disease					
Zeldenrust et al 2020 United States, Canada, Israel and the Netherlands	Parkinson's Foundation Centres of Excellence In 2009, the Parkinson's Foundation started the Parkinson's Foundation Parkinson's Outcomes Project through internationally associated CoEs.	5,145 patients from the United States, Canada, Israel and the Netherlands from 19 out of 21 centres participating in the Parkinson's Foundation Parkinson's Outcomes Project 2011–2016.	Cross-sectional analyses examining differences in rates of hospital encounter (HE) or repeat HE (re-HE) between CoEs. A HE was defined as an emergency room visit or a hospital admission reported by the participant during the	After adjustment for significantly confounding factors, two centres had significantly lower odds for hospitalisation admission and emergency room visit and four centres had significantly higher odds than the average centre.	While the majority of sites performed at an average level, outlier centres had significantly lower rates of HEs and re-HEs. The results implied that the practices carried out in some CoEs prevented hospitalisation.

Study	CoE	Population	Methodology	Results	Key findings
			<p>first year of follow up or later. A re-HE was any HE subsequent to a previously reported HE.</p> <p>Longitudinal analyses examined HE and re-HE rates over time in the whole cohort.</p> <p>Multivariate logistic regression was used to estimate the odds ratio for hospitalisation, adjusted for risk factors.</p>	<p>Four centres had significantly lower hazard ratios for time to re-hospitalisation compared to the average centre.</p> <p>Reducing hospital admission rates in those centres with higher-than-average rates would reduce overall hospitalisations by 11%.</p> <p>Applied to Parkinson's disease patients aged over 65 nationwide, this represents a potential for cost savings of greater than \$1 billion over 48 months.</p>	<p>This difference in care might have reflected local care practices; this is an important question.</p> <p>Centres with particularly low rates of hospitalisation might be able to provide clues in terms of the best practices for prevention of hospitalisation in this patient population.</p>

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