

ORIGINAL RESEARCH

Improving Continuity of Care Reduces Emergency Department Visits by Long-Term Care Residents

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Introduction: Care by Design™ (CBD) (Canada), a model of coordinated team-based primary care, was implemented in long-term care facilities (LTCFs) in Halifax, Nova Scotia, Canada, to improve access to and continuity of primary care and to reduce high rates of transfers to emergency departments (EDs).

Methods: This was an observational time series before and after the implementation of CBD (Canada). Participants are LTCF residents with 911 Emergency Health Services calls from 10 LTCFs, representing 1424 beds. Data were abstracted from LTCF charts and Emergency Health Services databases. The primary outcome was ambulance transports from LTCFs to EDs. Secondary outcomes included access (primary care physician notes in charts) and continuity (physician numbers and contacts).

Results: After implementation of CBD (Canada), transports from LTCFs to EDs were reduced by 36%, from 68 to 44 per month ($P = .01$). Relational and informational continuity of care improved with resident charts with ≥ 10 physician notes, increasing 38% before CBD to 55% after CBD ($P = .003$), and the median number of chart notes increased from 7 to 10 ($P = .0026$). Physicians contacted before 911 calls and onsite assessment increased from 38% to 54% ($P = .01$) and 3.7% to 9.2% ($P = .03$), respectively, before CBD to after CBD.

Conclusion: A 34% reduction in overall transports from LTCFs to EDs is likely attributable to improved onsite primary care, with consistent physician and team engagement and improvements in continuity of care. (J Am Board Fam Med 2016;29:201–208.)

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Frail older adults living in long-term care facilities (LTCFs) have high rates of complex comorbidity and benefit from coordinated comprehensive primary care. It is therefore useful to examine models

of care to ensure primary care provision in LTCFs is optimized to improve resident well-being and health outcomes. In this Canadian context, rather than having short stays for rehabilitation, LTCF residents are generally transitioning to long-term care as a permanent move because their care needs increase beyond home care capacity and they are usually nearing the end of life.

In 2006 the Primary Care of the Elderly (PCOE) project conducted a study examining long-term care in the Capital District Health Authority (CDHA), Halifax, Nova Scotia, Canada. The project identified several concerns, including frustration among medical directors with the lack of care coordination; a reduced number of family physi-

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Conflict of interest: BC is the district medical director of Integrated Continuing Care at the Capital Health District and has been instrumental in establishing and coordinating the Care by Design™ Model. His role was limited to providing background information on the model and participating in the study design and editing of the manuscript, and he had limited involvement in data collection and analysis and the interpretation of findings.

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cians working in long-term care; high rates of transports from LTCFs to emergency departments (EDs), even among those with “do not transport” orders; and lack of consultation with family physicians.¹ At that time, residents living in LTCFs in Halifax, Nova Scotia, were responsible for finding their own family physician for primary care. People moving into LTCFs could keep their existing family physician if the physician was willing and able to provide care in the LTCF. If the physician was unable or unwilling to continue, before admission the resident had to find a local family physician who would agree to provide care, a requirement that may vary by jurisdiction. Numerous studies have demonstrated that uncoordinated models of primary care in LTCFs are less effective than those that are well coordinated, can result in limited access to proper primary care, and lead to suboptimal outcomes for elderly residents, particularly for end-of-life care.^{2–7} Transport of residents from LTCFs to EDs is of particular concern from both patient and system perspectives. Older patients may suffer transfer distress (eg, disorientation, confusion, and discomfort at the time of transfer) and be exposed to iatrogenic complications (eg, infections, pressure ulcers, and falls) in acute care.⁸ From a systems perspective, unnecessary transfers place increased pressure on already stretched acute care resources, come at a higher cost,⁸ and may be an indication of suboptimal primary care within LTCFs, signaling potential gaps in care processes.⁹

To address concerns raised by the PCOE study, in the summer of 2009 the CDHA implemented a new model of care, trademarked in Canada as “Care by Design” (CBD), in its LTCFs. The central component of the CBD model is a dedicated family physician per floor (average of 30 residents/physician) with weekly onsite visits to see residents identified by nurses as needing primary care and coordinated 24/7 on-call physician coverage for urgent or emergent issues provided by a roster of the 33 participating CBD physicians. Typically, this would distribute to 1 LTCF floor/physician, who would spend half a day each week scheduled on site and respond to emergent needs 24/7. Between 9 AM and 5 PM weekdays the assigned floor doctor would respond to calls and onsite needs. Overnight call coverage is shared among the CBD team of family physicians, who are divided into 5 networks, each covering 400 to 500 beds. Before CBD, there was a fragmented system of call cover-

age that led to problems reaching physicians during emergency situations and reports of infrequent physician primary care visits. Practice standards of CBD include 30-minute response time by on-call physicians to calls from LTCFs, on-call sign-out communications, on-call telephone support, and standing orders and protocols. Physicians are compensated through a fee-for-service paradigm (which they would be billing within their community practice if not in an LTCF), as well as an on-call stipend provided by the CDHA. The cost of CBD for physicians is the fee-for-service billing (considered cost-neutral) and \$175 per day on call for each network of 400 to 600 beds.

At the heart of CBD is an interdisciplinary team approach with regular team meetings of the family physicians, LTCF nurses, care assistants, paramedics, pharmacists, and facility-dependent interprofessional staff (eg, social workers, occupational therapists, physiotherapists, and recreational therapists). Before the CBD model, it was rare for family physicians to attend LTCF care team meetings. The CBD physicians self-selected participation in the program, demonstrating a special interest in care for LTCF residents, and most have additional training in care of the elderly (this is an additional 6- to 12-month training period pursued after a family medicine residency program or as a reentry program for experienced family physicians).

CBD was implemented with the goal of coordinating primary care; increasing access and the relational and informational continuity of care; and reducing transports of LTCF residents to EDs.^{1,10} CBD is coordinated by the office of the director of continuing care at the CDHA. This office oversees the programs and processes of CBD, ensuring that quality policies and procedures (eg, the Long-term Care Comprehensive Geriatric Assessment) are developed and rolled out across LTCFs at the same time.¹¹ The director ensures that physicians and LTCFs follow through with commitments enshrined in CBD, otherwise the LTCFs do not receive the benefits associated with CBD, such as the recruitment and retention of CBD physicians and medical directors who commit to the program. Each facility continues to have a medical director; this CBD physician is responsible for 1 floor or wing of residents and plays a key role in CBD coordination. Though they do not provide care for all residents within their facility, they play a lead-

ership role for CBD within the LTCF. CBD also includes a structure whereby the medical directors and CBD physicians meet regularly, hold an annual local conference, and work together on educational and program development. Additional details on the CBD model can be found in a recently published description of the program,¹⁰ and key strengths of the model are summarized below.

The strength of the continuity provided by the new model is further supported by core features of the model:

1. Physicians sign a “standards of care” document that states they will respond within 30 minutes by phone for all calls and on site as required. Between 8 AM and 5 PM, this on-call service is provided by the CBD family physician; after hours the service is provided by the on-call doctor from the CBD team.
2. The doctor approves with each facility which day of the week he or she will be on site to provide regular care. It must be a weekday, and it must be either morning or afternoon. These times are critical to enable point 3.
3. The daytime hours are critical because that is the time the facility has the most staff available to make a clinical team on the day the physician provides their regular care. The facilities prepare for the physician’s day, with all acute care concerns and any follow-up cases, including charts and appropriate Article work and team availability, which, at a minimum, includes the charge nurse. On drug review days the team may include a pharmacist. Some facilities supply other health professionals as well.
4. All facilities participate in a new governance structure, created by CBD, which includes 2 councils to provide co-leadership of all that happens clinically for each physician per floor site so that the new model has consistency in approaches to medical care (ie, notes in the chart and care directives). Each facility is represented on these 2 councils with the District Health Authority, which participates in determining what evidence-based policies and protocols are developed and implemented. No policy goes forward if a facility cannot support it. Processes and protocols such as end-of-life orders, on-call guidelines, diabetes guidelines, and comprehensive geriatric assessment are first accepted by all facilities, and then facilities

are expected to implement and maintain them with oversight from their medical directors, who report to the facilities and to the director of continuing care at the CDHA.

This article presents key findings of our CBD (Canada) before-and-after study to assess the changes in primary care provision (ie, access, relational and informational continuity) and ED transport rates before and after implementation of the new model.

Methods

This was an observational time series study that was conducted over two 5-month time periods: time period 1 (T1), before the CBD model (September 1, 2008, to January 31, 2009); and time period 2 (T2), after the CBD model (September 1, 2010, to January 31, 2011). These time periods were chosen to include the same months in each year to minimize confounding by season (eg, 911 calls and transport rates were expected to increase during influenza season). Data were obtained through chart abstraction using standardized electronic data collection forms directly into a Microsoft Access database by research nurses using a laptop computer. The data abstraction form was based on the original PCOE study. Data were from 2 sources: LTCF charts and Emergency Health Services (EHS) records generated after 911 calls. LTCF charts had both paper and electronic format, depending on the LTCF and the time period. All chart abstraction data were entered into a database on a password-protected computer. Statistical analyses were conducted in SAS software version 9.2 (SAS Inc., Cary, NC). Details of the CBD study protocol have been published elsewhere.¹²

Ethics

The study was approved by the CDHA Research Ethics Committee and by the individual research ethics boards of participating LTCFs (where these existed).

Setting

In 2011 the census metropolitan area of Halifax, Nova Scotia, Canada, had a population of 390,328 people, with 13.1% aged ≥ 65 years.¹³ It is predicted that by 2036, 30% will be ≥ 65 years, with 10% being >80 years of age.¹⁴ Of the 12 LTCFs

located in the CDHA and participating in CBD (Canada), 10 participated in this study. There were no changes in the participating facilities between the before/after time periods with respect to staffing complements and models of care, apart from CBD (Canada). Two CDHA LTCFs were excluded because their model of primary care differed from that of CBD (Canada) in important ways, which would make them difficult to compare: 1 is a teaching facility and 1 has a full-time “nursing home physician.”

Participants

The population of interest consists of residents in 1434 beds at the 10 participating LTCFs. The data query began with an EHS database detailing all 911 calls (361 calls in T1 and 237 calls in T2) and all ED transports of residents from those 10 LTCFs during the 2 time periods (341 transports in T1 and 219 transports in T2). All residents with a 911 call were included. Some residents have >1 call to 911. LTCF charts for all residents involving EHS during the time period were then abstracted (203 residents in T1 and 150 residents in T2). The sample of residents with 911 calls was selected because the rates of ED transfer was the key variable of interest, and rates could be determined since the number of beds remained the same between time periods. For residents with a 911 call, information on transport status and related outcomes were collected, identifying those who were and were not transported to an ED.

Measurement

The primary outcome measure was average monthly emergent ambulance transports from an LTCF to an ED (not including routine transfers to medical appointments or calls to the LTCFs for nonresidents such as visitors or staff) for all residents of the 10 LTCFs. Using the EHS database, which is maintained by the provincial ambulance service, from both before and after CBD implementation, the number of 911 calls was identified first, from which the average number of monthly ambulance transports among LTCF residents was ascertained.

Data abstracted from LTCF charts were used to develop the secondary outcome measures linking to the resident through health card numbers. Access was measured by the number of physician notes in charts, which indicated that a visit occurred. Infor-

mational continuity and relational continuity (defined below) were indicated by the overall number of family physicians providing care in the 10 LTCFs, the number of notes in each resident's chart, and whether the family physician had been contacted by LTCF staff and provided onsite assessment before transport to an ED. An audit to verify the accuracy of data collection was conducted for 10% of charts.

Analysis

The mean monthly number of 911 calls was computed by ascertaining the number of calls per month for the total number of beds included in the 10 LTCFs over both T1 and T2. The mean number of monthly ambulance transports then was calculated for residents for whom a 911 call had been made. A small number of resident charts did not have information on whether the resident's family physician had been contacted before transport (39 unknown in T1; 8 unknown in T2) and were excluded from the analysis of this variable. To ensure a fair comparison, only those residents who lived in the LTCF for the full 5-month time period were included in the analysis of the number of notes in patient charts ($n = 138$ in T1 and $n = 97$ in T2).

Descriptive statistics were computed for variables of interest for the secondary outcome measures. Pearson chi square tests were used to identify whether categorical variables were statistically significantly different between the before/after CBD time periods. The Wilcoxon rank-sum test was used to compare means.

Results

The median age of residents with 911 calls before CBD ($n = 203$) was 86 years, 73% were women, and 57% of participants were documented as having dementia. Similarly, participants after CBD ($n = 150$) had a median age of 85 years, 80% were women, and 53% were documented as having dementia. The average length of stay decreased from a mean of 5.84 years (standard deviation, 3.45 years) to 4.50 years (standard deviation, 2.20 years) between T1 and T2 (Table 1).

Two main trends were observed after the CBD family physician model was instituted: (1) a reduction in the overall number of 911 calls and average monthly transports of LTCF residents to an ED; and (2) increased relational continuity of care, with

Table 1. Long-term Care Facility Resident Characteristics Pre- and Post-Care by Design

Patient Characteristics	Before Care by Design ^{TM*} (n = 203)	After Care by Design ^{TM†} (n = 150)	P Value
Age (years), median (IQR)	86.0 (81.0–93.0)	86.0 (79.0–92.0)	.18 [‡]
Sex			
Female	72.9 (148)	79.58 (113)	.47 [§]
Missing	—	1.41 (2)	
Cognitive status			.78
Dementia	57.1 (116)	54.23 (77)	
Within normal limits	38.4 (78)	26.76 (38)	
Other	1.9 (4)	3.52 (5)	
Missing	2.4 (5)	15.49 (22)	
Duration of stay in LTCF (years), mean (SD)	5.84 (3.54)	4.5 (2.20)	<.0001 ^{**}

Data are % (n) unless otherwise indicated.

*September 1, 2008, to January 31, 2009.

†September 1, 2010, to January 31, 2011.

‡Wilcoxon rank-sum test.

§ χ^2 Test.

|| χ^2 Test (rate of dementia).

***t* Test.

IQR, interquartile range; LTCF, long-term care facility; SD, standard deviation.

an overall reduction in the ratio of the number of providers to the number of residents, and increased informational continuity, with improved documentation of primary care visits captured in resident chart notes after implementation of the CBD physician model.

Reduction in Both 911 Calls and Average Monthly Transports for LTCF Residents

After implementation of the CBD family physician model there was a 34% reduction in the average monthly number of 911 calls from LTCFs; the total number of 911 calls for all 10 LTCFs decreased from an average of 72 to 47 per month ($P = .0001$) (Table 2). The average number of monthly transports from an LTCF to an ED was also reduced by 36% after implementation of the CBD

family physician model, decreasing from 68 to 44 ($P = .0001$) (Table 2). Overall, 92.3% of 911 calls resulted in a transport to an ED before CBD and 90.4% after CBD.

Increased Relational and Informational Continuity of Care

Relational and informational continuity improved with increased family physician contact following implementation of CBD, as evidenced by the number of family physician notes in patient charts. For those residents living at an LTCF during the entire study period, the number of resident charts with >10 physician notes increased from 38% before CBD to 55% after CBD ($P = .002$), with the median number of chart notes increasing from 7 to 10 ($P = .0026$) (Table 3).

Table 2. 911 Calls and Ambulance Transports from Long-Term Care Facilities to Emergency Departments

	Before Care by Design ^{TM*}	After Care by Design ^{TM†}	Change (%)	P Value (<i>t</i> Test)
	Time 1 (n = 361)	Time 2 (n = 237)		
911 calls/month from LTCF (n)	72.2 (10.96)	47.4 (5.94)	–34	<.0001
	Time 1 (n = 341)	Time 2 (n = 219)		
Monthly ambulance transports from LTCF to ED (n)	68.2 (11.32)	43.8 (5.45)	–35.8	<.0001

Data are mean (standard deviation).

*September 1, 2008, to January 31, 2009.

†September 1, 2010, to January 31, 2011.

ED, emergency department; LTCF, long-term care facility.

Table 3. Physician Care and Continuity in Long-Term Care Facilities

Secondary Outcome Measures (Physician Care and Continuity in LTCFs)	Before Care by Design ^{TM*}	After Care by Design ^{TM†}	Change (%)	P Value
	Time 1 (n = 164)	Time 2 (n = 142)		
LTCF physician contacted before EHS call (for all residents with a 911 call)	38.4 (63)	53.5 (76)	+15.1	.01 [‡]
Onsite assessment conducted by a family physician before EHS call (for all residents with a 911 call)	3.7 (6)	9.2 (13)	+5.5	.03 [‡]
EHS calls that resulted in transports (most recent 911 call only)	94.5 (155)	88.0 (125)	−6.5	.08 [‡]
Notes in patient charts (only residents living in an LTCF for the full time period), n (%)	Time 1 (n = 138)	Time 2 (n = 97)		
0–1	12.3 (17)	3.09 (3)	−9.2	.002 [‡]
2–9	47.8 (66)	35.1 (34)	−12.7	
≥10	37.7 (52)	54.6 (53)	+16.9	
Missing	2.2 (3)	7.2 (7)		
Notes in patient charts (only residents living in an LTCF for the full time period), median (IQR)	7 (3.0–12.0)	10 (7.0–13.0)		.0026 [§]

Data are mean (standard deviation).

*September 1, 2008, to January 31, 2009.

†September 1, 2010, to January 31, 2011.

‡ χ^2 Test.

§Wilcoxon rank-sum test.

EHS, Emergency Health Services; IQR, interquartile range; LTCF, long-term care facility.

With the implementation of CBD, the number of family physicians providing care in 8 of the CDHA facilities (representing 1143 beds) decreased by 84%, from 214 to 33 physicians, with each physician assuming care for a larger number of residents clustered on a single unit or ward. Data before CBD for the other 2 facilities (n = 291 beds) were not available for comparison. With the implementation of CBD there was an increase in LTCF physicians being contacted before 911 calls: from 38% to 54% ($P = .01$) (Table 3). Onsite assessment conducted by family physician before 911 calls also increased, from 3.7% before CBD to 9.2% after CBD ($P = .03$).

Discussion

The CBD (Canada) model of dedicated family physician coverage by floor or unit of an LTCF with weekly scheduled visits and 24-hour-a-day on-call coverage was associated with almost a one-third reduction in transports of residents to EDs and an increase in relational and informational continuity of resident care.

As is generally the case in observational studies, causation is difficult to establish. It is possible that the differences before and after CBD observed in this study could have had other contributors as

well. The study was designed to minimize additional confounders (eg, seasonal variation in ED transfers, models of care other than the pure CBD, no other contributing policy changes between the 2 time periods), but some potential for residual confounding remains. It is reassuring that the resident characteristics summarized in Table 1 were fairly similar in the 2 time periods, with the exception of decreased duration of stay in the LTCF. This likely reflects changes in patterns of use of LTCF services, with increased emphasis on supporting older adults in their homes for as long as possible, leading to greater frailty and closer proximity to the end of life at admission to an LTCF. The fact that there was a decrease in ED transports in the face of this proxy measure for frailty strengthens the findings of the study. Reliance on documentation for chart reviews was another limitation of our study; our measure of the quantity of physician contacts was a count of notes in the LTCF chart and did not capture the quality of these encounters or even their duration. In addition, it is possible that residents who needed care did not receive it, which cannot be determined by the absence of a note in the chart. However, the presence of full-time nursing staff who are monitoring and identifying needs for care from an established CBD system with 24/7

on-call provisions and response protocols is intended to avoid this issue. Our ability to link 2 different sources of data (LTCF and EHS charts) was a strength of our approach. In particular, use of the EHS database ensured that no 911 calls or ED transfers were been missed during the time periods considered. Our study was further strengthened by including 10 of 12 LTCFs participating in the CBD model.

The concept of continuity of health care has been delineated into 3 types: informational, relational, and managerial.^{15,16} The CBD study findings speak to the significance of the new model in informational and relational continuity. Informational continuity refers to the use of information on prior events and circumstances for appropriate care of an individual.^{15,16} This is characterized by documentation and knowledge of the patient's values, preferences, and social contexts through a stable patient-provider relationship. Informational continuity, "the common thread linking care from one provider to another and from health care event to another"¹⁶ is found in the increased communication from physicians via chart notes and responses to urgent care situations. Our study found that the number of documented primary care visits increased after implementation of CBD, as did physician contact and assessment on site before 911 calls were made. The proportion of patients receiving ≥ 10 physician notes in their charts increased significantly in the time period after CBD implementation, and the median number of notes made increased moderately, from 7 to 10, suggesting that while the primary care needs of more residents are being met, patients are not being "overserved" by the CBD model. We hypothesize that these changes, along with clearer after-hours on-call coverage, contributed to the 34% decrease in 911 calls and 36% decrease in ED transfers that we observed following CBD implementation.

It logically follows that the dramatic 82% reduction in the total number of family physicians providing care in LTCFs has had a number of benefits, particularly on relational continuity (ie, an ongoing therapeutic relationship between a patient and 1 or more providers, leading to stronger relationships, better information transfer and update, and more consistent management).^{15,16} The new model has resulted in increased relational continuity between care team physicians, nurses, residents, and family members; fewer family physicians provide regular

weekly visits, improving the therapeutic relationship between the patient and provider. It has also allowed family physicians with a particular interest and expertise in providing care in the LTCF setting to focus more on this work. In addition, coordination through a single on-call system has greatly improved after-hours coverage by family physicians who are all a part of the CBD team, facilitating continuity of care and communication. Because these innovations in the model of care were implanted as a package, it is not possible to tease out which factors are most significantly related to the outcomes, only that the CBD model itself was associated with these outcomes. However, this is consistent with the existing literature, suggesting that it is often more effective to bundle interventions than to implement single interventions in isolation.¹⁷

By significantly reducing the number of physicians working in long-term care while simultaneously enhancing their engagement, participating physicians are more likely to include those most interested in providing care for this population, enabling accountable and collaborative care. This prospect was a major enticement for LTCFs to join CBD. For the facilities to receive this new model, they all had to agree to the standards, expectations, processes, and participation. The common thread between physicians and facilities is that they all wanted to participate in quality, manageable, and enhanced work environments for long-term care residents. A by-product was fewer transfers to an ED.

Conclusion

Implementation of the CBD (Canada) model in LTCFs is associated with improved continuity of care and fewer ED transfers. Further research evaluating its impact on specific aspects of care (eg, end-of-life care and care for residents with frailty and/or dementia and issues of polypharmacy) is underway.

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