

Breaks in continuity of care and the rural senior transferred for medical care under regionalisation

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Abstract

Continuity of care, defined as the patient experiencing coherent care over time and place, is challenged when a rural senior with multiple medical problems is transferred to a regional hospital for acute care. From an illustrative case of an older patient with pneumonia and atrial fibrillation, we catalogue potential breaks in continuity of care. Optimal continuity of care is characterised not only by regular *contact* with the providers who establish *collaboration* with patients and their caregivers, but also by *communication*, *co-ordination*, *contingency*, *convenience*, and *consistency*. Because it is not possible to have the same providers continuously available (relational continuity), for continuity of care, there is a need for integrative system approaches, such as: (1) policy and standards, disease management programs, integrated clinical pathways (management continuity), (2) electronic health information systems and telecommunications technology (communication continuity). The evaluation of these approaches requires measures that account for the multi-faceted nature of continuity of care.

Keywords

continuity of care, patient, rural, tertiary centre, quality of care, co-ordination, integrated care

Introduction

Continuity of care is essential for quality of care, but its importance may be unrecognised [1]. Continuity of care has been confusing because it means different things to different people. Traditionally, it has been defined by care by a family physician [2–4]; however, modern health care depends on a variety of service providers in different settings over time. Thus, continuity of care has been defined more broadly [5], and as has come to signify coherent health care with a seamless transition over time between various providers in different settings. Reid et al. [6] described three components of continuity of care: relational (ongoing patient-provider relationships), management (co-ordination of care), and informational (information transfer). Given the complexity of modern health care, it is not surprising that there are many potential breaks in continuity of care.

Assuring continuity of care for an older patient with both acute and chronic conditions is challenging, and especially so for rural patients [7]. About one third of Canadians live in rural areas as defined by the OECD (less than 150 inhabitants per square kilometre); in Saskatchewan the population is even more rural with about 60% of living in rural areas [8, 9]. The challenge of continuity of care for rural seniors may be increasing for several reasons. First, many diseases now have evidence-based therapies needing regular monitoring and careful follow-up [10]. Second, the rural population is ageing. There is an increasing 'old age dependency ratio,' i.e. the population age 65 years and older as a percent of the population age 15–64 [11]. Third, health care providers are unevenly distributed in rural areas [12]. Fourth, closure of rural hospitals, as a part of regionalisation in health care delivery, makes transfer to regional centres necessary [13]. Fifth, at acute care centres, there have been decreases in average

length of hospital stays and increases in average patient acuity [14].

Based on our experiences in caring for rural seniors, case conferences with a variety of health care groups, and review of relevant publications, we discuss a case scenario illustrating the multi-faceted nature of continuity of care. Using the 'quality grand rounds' format [15], we catalogue breaks in continuity of care. Such a catalogue may be useful for improving continuity of care [16]. The aim of this paper is to characterise continuity of care in order to measure and improve quality of care and health outcomes. (For our illustrative case, we developed a case scenario based on an actual case with some additional features taken from two others. Our catalogue of breaks in continuity of care was compiled from discussions with a variety of audiences: family medicine, internal medicine, neurology, cardiology, quality of care committee, and provincial collaborative group for integrated care pathways (health services researchers, administrators and multidisciplinary providers). All rounds were presented by HJB during a two-year period in 2001–2003. All rounds began with the case presentation during which attendees were asked: 'What went wrong?' and 'What are potential solutions?' Attendees responded orally and/or by hand-in notes.)

Case

A 75-year-old man with a history of type 2 diabetes, hypertension and osteoarthritis is transferred to a regional tertiary care centre with acute stroke. He has a right-sided hemiparesis and dysphasia. He has atrial fibrillation but was not on warfarin therapy. Review of his chart showed that he had atrial fibrillation when he was admitted with pneumonia the year before.

Quality of care is receiving widespread attention [17–19] and means getting the right effect (patient outcome and satisfaction) by providing the right service (process), at the right time and place (access), and for the right price (efficiency). Failure of our patient to receive warfarin anticoagulation reflects a quality of care problem; chronic warfarin therapy, maintaining the INR (international normalised ratio) between 2 and 3, reduces the risk of cardioembolic stroke from atrial fibrillation by two thirds [20]. This quality of care problem is common worldwide, in some series, less than half of eligible patients receive warfarin [21–26]. Barriers to anticoagulation have been classified according to the patient, provider and system [27]. Improving health care entails changing systems to meet the needs of patients not organisations [28].

On a Monday one year before, our patient presented to a rural health care centre with cough. He was on metformin for diabetes, enalapril for hypertension, and ibuprofen for osteoarthritis. On exam, he had breathlessness and fever. He had an irregular, fast pulse and chest crackles. The white cell count was elevated, the chest radiograph showed a right middle lobe pneumonia, and the electrocardiogram showed atrial fibrillation with fast ventricular response. He received oxygen, cefuroxime and digoxin. Because acute care beds had been closed at the local hospital, he was transferred to a regional care hospital three hours away.

Our patient required complex medical care. He had an acute severe illness (pneumonia) superimposed on pre-existent (diabetes, hypertension, osteoarthritis) and newly diagnosed (atrial fibrillation) chronic problems. This patient required several medications and regular follow-up. Under regionalisation, rural patients are being transferred to referral centres for acute care. Regional centres may have better patient outcomes [29–32], and cut health care delivery costs because of higher volumes.

While in the regional hospital, the patient was seen by a resident in the emergency room and by a senior medical student supervised by an attending internist on the wards. He was in an off-service bed for one day before being transferred to a medical ward. He improved but remained in atrial fibrillation. A pharmacist gave him information on warfarin for stroke prevention. He was told that if his INR was less than 2.0, the warfarin would not be effective and that if his INR was greater than 3.0, the warfarin could cause bleeding. His wife, who managed his medications, was too frail for travel to visit him. On Friday, the patient was feeling better and had an INR of 2.0. He was discharged home with a one-week course of oral cefuroxime. He was to remain on metformin, enalapril, digoxin, and warfarin. He was told to make an appointment the next day with a physician for INR testing.

Breaks in contact occur during patient transfer between providers and between settings, which can occur at patient admission [33], during hospitalisation (nursing shift change and inter-facility transfer [16]), or at discharge [34,35]. Such transitions at night-time and on weekends may increase mortality [36–38]. Hospital care involves a team of nurses and physicians supported by pharmacists, physiotherapists, occupational therapists, and home care nurses [39]. Increasingly, nurses no longer provide primary care for inpatients, but rather must dispense medications and look after only the sickest of patients. Because of nurse and bed shortages, managers call physicians to 'encourage' patient discharge. Providers may have limited time for patient education and arranging follow-up. Care for chronic illness usually relies on the patient

and/or caregiver having sufficient education and training. In one study, one third of patients left hospital with an incomplete understanding of their medication [34]. For our patient, involvement of the caregiver was essential but did not occur because of distance to travel.

The weekend locum physician received a hand-written discharge letter listing the patient's diagnosis and medications. The repeat INR was 2.8. The physician instructed the patient to stay on the same dose and see his family doctor on Monday for repeat INR testing.

Many rural seniors have limited local access to health care services [40]. Although patients are more satisfied by having their own physician [41], many patients see more than one family physician per year [42]. Although rural physician numbers have increased modestly in recent years [43], their distribution is still uneven [44]. Locum physicians are needed to provide relief on weekends. Timely and concise discharge communication needs to be available to local providers detailing the diagnosis, care plan and medications [45]. Failure to provide this can contribute to hospital re-admission [46]. Transcribed narrative discharge summaries may not arrive before the first follow-up visit [47]. Hand-written discharge letters may be illegible and provide insufficient information. In an Australian study, 87% of 203 recently hospitalised patients were considered by their follow-up physicians to have inadequate documentation of discharge medications [34]. For our patient, the locum physician would have also benefited from having INR values from the previous few days. Had he known that the INR was already increasing, he might have prescribed a lower warfarin dose.

At home, the patient took ibuprofen for hip osteoarthritis as well as some herbal pills. On Sunday evening, his wife worried about his bleeding after glucose fingerstick testing. She called the regional health care centre and spoke with the internist on-call, who did not have access to recent health records. He recommended the patient to see his family doctor for INR testing. On Monday, when the patient saw his regular family physician, the INR was 4.8. The patient was advised to take acetaminophen, instead of ibuprofen, and stop the herbal pills. He was to hold the warfarin and have his INR tested the next day. Because of arthritis, the patient found it difficult to travel to town for INR testing. His wife thought he was on too many medications. At his next clinic appointment, he refused further warfarin but did accept aspirin therapy.

Our patient was on a number of drugs that could interact with warfarin, which has a narrow therapeutic index and potentially life-threatening adverse effects. For example, antibiotics decrease the warfarin dose

needed [48]. A variety of herbal products (e.g. ginkgo biloba, garlic, dong quai, danshen) affect the INR [49]. The home situation (home alone, family caregiver, supervised setting, or long-term institution) may affect continuity of care. Seniors with able caregivers may have better continuity of care [50]. Patient factors such as age, education, and functional capacity affect care [51]. Psychological factors (e.g. depression) may influence a patient's ability to adhere to the care plan [52]. Lack of availability of a health care provider to answer questions and concerns after hours may affect continuity of care. When providers do not have background health information or treatment plan, they may not be able to give appropriate advice. In the end, our patient had a challenging home situation and was inconvenienced by travel for INR testing; his family physician was not convinced that warfarin therapy was worthwhile.

The seven c's of continuity of care

For our patient, we believe continuity of care was a major issue. From discussions of this case during rounds, we compiled a list of potential breaks in continuity of care for our patient along with potential solutions. We categorised these in relation to the illness, the patient, the local provider, the regional care centre, and the health care system (Tables 1–5). What are the characteristics of optimal continuity of care? These can be summarised alliteratively by the seven c's (Table 6).

Contact

Our patient had contact with many different providers over a one-week period. Irregular contact may make it difficult to build trust in patient-provider relationships. Strong relationships may improve adherence to treatment regimens [53]. Regular contact allows the provider to know the patient well and monitor patient progress [54]. Patients prefer to have their own personal physician [55]. Increasing attention is being paid to retention of health care providers in rural areas, but this has been a vexing problem [56]. Canada is opening its first rural medical school [57]. Rural nurse practitioners may play a role [58]. Tele-health may be a way of improving access for rural patients [59].

Collaboration

In collaborative management, patients and their caregivers become self-reliant by education [60] and maintain responsibility for health information and self-management. Our patient and his wife caregiver did not receive sufficient patient education. Decision-aids

Table 1. Illness factors challenging continuity of care

Challenges to continuity	Case scenario	Potential solutions
Chronic illness	Atrial fibrillation, diabetes	Clinical practice guidelines
Complex management	Failure to carry out an evidence-based treatment in which benefit outweighs risks	Patients and providers require access to information: patient counselling, educational material, pharmacist teaching or Internet resources Search for preparation not needing INR monitoring
Complex regimen	Polypharmacy Warfarin treatment, narrow therapeutic index, minor and major side effects	Use of once a day and combination preparations where possible Pharmacist assistance
Side effects	Minor bleeding with warfarin	Information about side effects and what to do if occur
Drug interactions	Herbal and ibuprofen	Pharmacists, nurses, and physicians are aware of complete medication list Automated drug interaction detection Patient education regarding potential drug interactions including over-the-counter and herbals
Co-morbidity	Co-existent hypertension, diabetes, osteo-arthritis	Allow for greater clinic contact time and remuneration for care of patient with multiple medical problems

may allow patients to better participate in decision-making [61]. Patients need to learn about activity restrictions, dietary changes, warning symptoms, possible side effects, and time-lines for follow-up. They must make providers aware of their use of alternative treatments, such as herbal products, which may cause drug interactions.

Communication

Our patient experienced many transitions between providers and settings. In hospital, communication between providers (e.g. nursing station sign-over and multi-disciplinary rounds) is needed for continuity of care during transfer of responsibility in place and time. Now taken for granted, the health record was a major advance in continuity of care, documenting health information for providers over time. The record also transfers information between different providers. On hospital discharge, the discharge summary supports informational continuity. Some centres have developed automated discharge summaries [62]. Family physicians prefer standardised discharge summaries

[63]. Fax [64] or telephone [65] communication may improve continuity of care at discharge. Electronic health records may eventually improve transfer of information between settings [66, 67] but have not yet reached widespread use for hospitalised patients [68].

Co-ordination

A large multidisciplinary team cared for our patient. Continuity of care is based on teamwork [69]. With the division of labour, comes the need to co-ordinate efforts. This co-ordination may be accomplished by documentation (care plans) and/or by dedicated personnel (e.g. discharge co-ordinators). Such personnel oversee the completeness and clarity of information and assess the consistency of the care plan.

Contingency

Our patient and his caregiver had concerns after discharge home. For continuity, patients need timely access providers for urgent questions, worsening symptoms or complications. After-hours care by pri-

Table 2. Patient factors challenging continuity of care

Challenges to continuity	Case scenario	Potential solutions
Poor comprehension	Lack of understanding of multiple conditions requiring monitoring	Standardised and clear patient education Caregiver education Home care support
Immobility	Difficulty getting to lab	Home lab visits Telephone or tele-health visits Self-monitoring with home INR testing
Fear	Fear of medication and polypharmacy	Standardised and clear patient education
Lack of interest/attention/ concern/motivation	Patient not committed to anticoagulation	Provide education and encouragement to make it easier for the patient and provider to do the right thing
Cognitive dysfunction – dementia or delirium	Acute illness with delirium may interfere with ability to understand or remember medication	Written information Education of caregivers and or community providers either in person or over phone
Lack of social support	Wife not able to travel to regional care centre	Provide caregiver support Provide information regarding community resources Tele-health visit for wife to review medication information

many care providers may improve continuity [70]. Primary health care reform holds promise to give better round-the-clock access to multi-disciplinary providers, who are members of health care teams [71].

Convenience

Our patient had difficulty getting to the hospital for INR testing. The convenience of home INR testing [72, 73] may have helped our patient stay on the warfarin. Inconvenience related to parking, office waits, and, especially for rural patients, distance travel can decrease access to health care [70]. Continuity of care can make care more pleasant for patients because the system has ‘memory’ of the patient, so that patients need not keep repeating the same information to providers. Care can be individualised if patients’ values and preferences are known.

Consistency

Our patient’s local physician may have been ambivalent about warfarin therapy for his older patient. Consistency avoids conflicting advice from providers. Continuing medical education [74, 75] and guidelines

[76] attempt to improve the consistency of care given by various providers. For example, although age and fall risk may cause physicians to hesitate about anti-coagulation in seniors, this age group benefits substantially [77]. Bleeding risk is related more to the lack of control of the INR than it is to age [78].

Verification of patient and provider understanding of the recommended care plan can improve consistency. For example, prior to discharge, the tertiary care centre needs to ensure that both patients (and caregivers, if necessary) and the accepting physicians have an understanding of the condition and care plan. Both need to have an opportunity to ask questions. Checklists, protocols, and flow sheets may support the processes of care [79]. However, scarce resources, heavy workload and a lack of financial incentives for quality of care may impede such strategies [80].

System approaches to improving continuity of care

Because continuity of care is multi-faceted, improvement may be best accomplished by a combination of

Table 3. Local provider factors challenging continuity of care

Challenges to continuity	Case scenario	Potential solutions
Closure of local hospitals	Family doctor not able to provide acute care or visit patient in hospital	Co-ordinators required to ensure proper transfer of information to and from tertiary centres
Communication breakdown	Confusion about whom to call in case concerns and complications.	Develop standards or procedures for communication to and from tertiary centres Communication of most responsible provider
Turnover of physicians and nurses in local Centres	Locum physicians	Access to electronic health records for medical history
Lack of understanding of medication rationale	Lack of personnel or time for patient education	Provide resources for education in transfer Provide internet access to central medication list Provide access to central pharmacy
Disagreement with treatment recommended by regional providers	Lack of familiarity with evidence for warfarin therapy	Provide guidelines on which treatment decisions are based in transfer documentation Telephone contact for discussion between local providers and consultants

several possible approaches [81, 82]. For example, for warfarin therapy in seniors, a randomised controlled trial showed that a multi-component intervention decreased the risk of major bleeding [83]. According to the WHO position paper, integrated care is the ‘concept bringing together inputs, delivery, management and organisation of services related to diagnosis, treatment, care, rehabilitation and health promotion. Integration is a means to improve the services in relation to access, quality, user satisfaction and efficiency’ [84]. Integrated health care seeks connectivity, alignment and collaboration between sectors [85], which increases continuity.

Guidelines, policy and standards may be used to standardise processes for communication, co-ordination and consistency of health care. For example, guidelines exist for anticoagulation [86]. Rural family physicians are favourably disposed to guidelines, but would like to participate in their development [87]. Guidelines are important but insufficient for changing practice behaviour [88]. Clinicians may be overwhelmed with guidelines, which are of varying quality [89]. Policies and standards can enforce guidelines about communication and co-ordination of care; however, they are insufficient alone when providers lack resources.

Disease management has programs with four features: integrated health care delivery across the continuum, comprehensive knowledge base for prevention, diagnosis, treatment and palliation, clinical and administrative information systems, and continuous quality improvement. Disease management programs use a variety of interventions to improve provider adherence to guidelines including patient education, provider education, provider feedback, reminders and incentives [90]. Such programs have dedicated personnel overseeing the co-ordination and consistency of care [91]. For our patient, anticoagulation clinics have been established with the goal of improving quality, safety and ease of warfarin anticoagulation [92, 93]. Some clinics are staffed by pharmacists [94, 95] and some by nurses using computerised decision support and point-of-care testing [96]. Some clinics use in-person visits and some, telephone management [97].

Clinical pathways offer a similar approach to improving continuity of care [98, 99]. Based on clinical practice guidelines, patient education material, or prediction rules, clinical pathways are time-task care plans that foster multidisciplinary communication and co-ordination across time and place. The strongest evidence for the effectiveness of clinical pathways comes from

Table 4. Regional centre factors challenging continuity of care

Challenges to continuity	Case scenario	Potential solutions
Large team of house staff and attending at teaching hospital	Different physicians admission and on discharge	Sign-over Integrated care pathways with checklist of care plan
Failure to list medications/ failure to use medication aids	Failure to get complete list of medications including herbals	Complete list of medications
Shortening hospital stay so there is limited time for discharge preparation and education	Nurse shortage Bed shortage Overworked nurses High acuity patients	Avoid discharge without adequate preparation for discharge for complex patients Discharge patient only after education checklist is complete Assign education roles to specific providers
House staff and physicians are sleep deprived	Busy clinical teaching unit	Attention to shift scheduling and workload
Bed shortages mean transfer of patients to home hospital on short notice	Bed shortages	Transfer of care plan among providers
Inadequate transfer of information	Time delays in discharge summaries Insufficient information Excessive detail	Telephone contact between attending and local provider Confirm receipt of information Electronic medical records Faxed or emailed discharge summaries
Lack of structured procedures for information sharing	No individual responsible for ensuring appropriate transfer of information	Develop integrated care pathways that specify roles and responsibilities of providers in continuum of care Designated personnel responsible for transitions

a cluster randomised control trial for the management of pneumonia, in which 19 teaching and community hospitals were randomised to either usual care or a pathway. Patients were followed for six weeks; patients on the pathway had shortened hospital stays with no difference in clinical outcomes [100]. Funded by the Canadian Health Services Research Foundation, we are currently evaluating an integrated pathway aimed at improving continuity of care for patients discharged home on anticoagulation.

Electronic health information and telecommunications technology may give providers and patients access to health information and improve co-ordination of health care [101]. Electronic records, accessible over the Internet, may help; however, many rural areas and remote areas do not have high speed access and therefore, rely on telephone lines. Tele-medicine is expanding but still plays an uneven and limited role in rural health care [59, 102].

Measuring continuity of care

Because continuity of care is multi-faceted, it needs to be assessed from different perspectives [103]. For the **patient's perspective**, various questionnaires and satisfaction surveys have been developed to assess contact, collaboration, communication, contingency, convenience and consistency [104]. For example, the Care Continuity Index [105] was designed to assess the continuity of care received by seniors in their preparation for discharge from hospital and the care received post-discharge. The Care Transition Measure [106] was recently developed to assess the patient's views on quality of care transition. We have developed a disease-specific questionnaire for cardiac patients [107]. For the **local provider's perspective**, chart audits and surveys can assess contact, collaboration [34], and communication [45, 46]. For the **system's perspective**, chart audits, administrative database

Table 5. Health system factors challenging continuity of care

Challenge to continuity	Case scenario	Potential solution
Distance	Regionalisation with separation of local providers, patients and regional centres	Planning to avoid long distance transfers, closest centre, co-ordination of follow-up visits
Lack of attention to quality improvement	Lack of resources to focus on quality	Linkage of monitoring with improvement
	Lack of recognition of problem	Funding and personnel support of projects aimed at quality and continuity of care Liaison between rural and referral centres for discussion of issues Monitoring processes, outcomes and satisfaction
Lack of integrated health information systems	Laboratory results are not available to local provider	Integrated electronic health records with lab results, discharge summaries and care plans

analysis, and cohort studies for documentation, service utilisation (e.g. readmissions), medication usage, and health outcomes (e.g. morbidity and mortality) may provide measures of the consistency of care [108, 109]. More research is needed on how to best measure continuity of care during transitions within the health care system.

Given variation in health care delivery [80] we believe more research on continuity of care is needed that considers the various perspectives (patients, providers, health care system), components (relational, management and informational) [6], characteristics (contact, collaboration, communication, co-ordination, convenience, contingency and consistency), observational methods (patient and provider interviews, clinic and hospital chart audits, administrative database analysis, and controlled studies), and integrative system interventions (policy and standards, disease management programs, integrated clinical pathways, electronic health information systems and telecommunications technology). To determine the effectiveness of such interventions, we need prospective, controlled studies using validated and responsive measures collected independently.

Conceptual challenges

There are many challenges to considering continuity of care. First, the definition of continuity of care varies. For example, our discussion is based on broader definition of continuity of care. This definition goes beyond personal contact and assumes integration of

the health care system over time and place. Second, the characteristics of optimal continuity of care are interrelated. For example, consistency is a feature of effective communication and co-ordination. Similarly, communication is an essential for contact and contingency. Nevertheless, we believe each characteristic is sufficiently distinct and relevant to be considered. Third, because of the multi-faceted nature of continuity of care, we cannot be certain our list of characteristics is all-inclusive. We look forward to more discussion about continuity as health care systems aim for integration. Fourth, our case-based conceptual model may not be strictly generalizable to other health problems. For example, for a patient with a minor ankle sprain, continuity of care is relatively unimportant. For a patient with a skin laceration, some aspects of continuity of care are more relevant (e.g. patient collaboration with wound care, communication of tetanus immunisation status, and contingency in case of wound infection). For patients with various chronic complicated problems and circumstances, providers are most likely to recognise the importance of these the seven c's, whether it be for the care of an HIV infected child in the tropics, a patient with tuberculosis from the inner city, or a pregnant woman from a remote community. We believe our case-based model provides a starting point for considering, measuring and improving continuity of care.

Conclusion

In summary, we have identified many potential breaks in continuity of care based on an illustrative case of a

Table 6. Charting the “seven c’s” of continuity of care

Characteristic	Features
Contact	Regular visits with providers Outreach programs e.g. satellite clinics, tele-health
Collaboration	Education of patients and care-givers in self-management skills Patient decision-making
Communication	Health information and care plans are accurate, clear, concise, and timely Health information is available to providers as needed
Co-ordination	Providers know who does what Designated individual responsible for monitoring co-ordination of care
Contingency	Provider availability for questions, change in status, and complications Patient aware of potential problems and management required
Convenience	Patient does not need to keep repeating the same information (system has memory) Providers and system individualise management
Consistency	Best practice from clinical practice guidelines Flow charts, checklists, care plans, quality improvement, audit

rural senior with multiple chronic medical problems needing transfer to a regional centre for acute care. We have catalogued these breaks in relation to the

References

1. Nelson CW, Niderberg J. Patient satisfaction surveys: an opportunity for total quality improvement. *Hospital & Health Services Administration* 1990;35:409–27.
2. Gill JM, Mainous AG, Nsereko M. The effect of continuity of care on emergency department use. *Archives of Family Medicine* 2000;9:333–8.
3. Love MM, Mainous AG, Talbert JC, Hager GL. Continuity of care and the physician-patient relationship: the importance of continuity for adult patients with asthma. *Journal of Family Practice* 2000;49:998–1004.
4. Hanninen J, Takala J, Keinanen-Kiukaanniemi S. Good continuity of care may improve quality of life in Type 2 diabetes. *Diabetes Research and Clinical Practice* 2001;51:21–7.
5. Sparbel KJ, Anderson MA. A continuity of care integrated literature review, part 2: methodologic issues. *Journal of Nursing Scholarship* 2000;32:131–5.
6. Reid R, Haggerty J, McKendry R. Defusing the confusion: concepts and measures of continuity of health care. Centre for Health Services and Policy Research: Available from: URL:http://www.chsrf.ca/docs/finalrpts/cr_contcare_e.pdf
7. Coward R, Bull C, Kukulka G, Galliher J. *Health services for rural elders*. New: Springer; 1994.
8. Organisation of Economic Co-operation and development (OECD). *Creating rural indicators for shaping territorial policies* (Paris: OECD).
9. Health Canada [Online]. Available from: URL:http://www.hc-sc.gc.ca/index_e.html
10. Worrall G, Freake D, Kelland J, Pickle A, Keenan T. Compliance of rural and urban family physicians with clinical practice guidelines for non-insulin-dependent diabetes: a comparison. *Canadian Journal of Rural Medicine* 1997;2:169–75.
11. The Atlas of Canada [Online]. Available from: URL:<http://atlas.gc.ca/site/english/index.html>

illness, the patient, the local provider, the regional centre and the health care system. To prevent breaks in continuity of care, we need to consider the seven c’s characterising optimal continuity of care: contact, collaboration, communication, co-ordination, contingency, convenience and consistency. For optimal continuity of care, we need to not only foster patient-provider relationships but also improve delivery systems through management (guidelines, policy and standards; disease management; and integrated clinical pathways) and information (patient education, electronic health information; and telecommunications technology). More research is needed on how best to measure and improve continuity of care considering various perspectives, components, determinants, observational methods and integrative interventions.

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12. Kindig DA, Movassaghi H. The adequacy of physician supply in small rural counties. *Health Affairs (Millwood)* 1989;8:63–76.
13. Liu L, Hader J, Brossart B, White R, Lewis S. Impact of rural hospital closures in Saskatchewan, Canada. *Social Science & Medicine* 2001;52:1793–804.
14. Saunders LD, Bay KS, Alibhai AA. Regionalisation and hospital utilisation: Alberta 1991/2–1996/7. *Healthcare Management Forum* 1999;12:38–43.
15. Wachter RM, Shojania KG, Saint S, Markowitz AJ, Smith M. Learning from our mistakes: quality grand rounds, a new case-based series on medical errors and patient safety. *Annals of Internal Medicine* 2002;136:850–2.
16. Cook RI, Render M, Woods DD. Gaps in the continuity of care and progress on patient safety. *British Medical Journal* 2000;320:791–4.
17. Chassin MR, Galvin RW. The urgent need to improve healthcare quality: National Institute of Medicine National Roundtable on Healthcare Quality. *Journal of the American Medical Association* 1998;280:1000–5.
18. Macleans Health Report. Where we get the best healthcare. *Maclean's* June 2001.
19. Sask Government Saskatchewan healthy people and healthy province: action plan for Saskatchewan Healthcare: a summary. Available from: URL:<http://www.health.gov.sk.ca>
20. Hart RG, Benavente O, McBride R, Pearce LA. Antithrombotic therapy to prevent stroke in patients with atrial fibrillation: a meta-analysis. *Annals of Internal Medicine* 1999;141:492–501.
21. Stafford RS, Singer DE. Recent national patterns of warfarin use in atrial fibrillation. *Circulation* 1998;97:1231–3.
22. The CQIN investigators. Thromboembolic prophylaxis in 3575 hospitalised patients with atrial fibrillation. *Canadian Journal of Cardiology* 1998;14:695–702.
23. Cohen N, Almozni-Sarafian D, Alon I, Gorelik O, Koopfer M, Chachashvily S, et al. Warfarin for stroke prevention still underused in atrial fibrillation: pattern of omission. *Stroke* 2000;31:1217–22.
24. Adhiyaman V, Kamalakaan D, Oke A, Shah IU, White AD. Underutilisation of antithrombotic therapy in atrial fibrillation. *Journal of the Royal Society of Medicine* 2000;93:138–40.
25. Samsa GP, Matchar DB, Goldstein LB, Bonitio AJ, Lux LJ, Witter DM, et al. Quality of anticoagulation management among patients with atrial fibrillation: results of a review of medical records from 2 communities. *Archives of Internal Medicine* 2000;160:967–73.
26. Jackson SL, Peterson GM, Vial JH, Daud R, Ang SY. Outcomes in the management of atrial fibrillation: clinical trial results can apply in practice. *Internal Medicine Journal* 2001 Aug;31(6):329–36.
27. Bungard TJ, Ghali WA, Teo KK, McAlister F, Tsuuki RT. Why do patients with atrial fibrillation not receive warfarin? *Archives of Internal Medicine* 2000;160:41–6.
28. Berwick DM. A primer on leading the improvement of systems. *British Medical Journal* 1996;312:619–22.
29. Hannan EL. The relation between volume and outcome in healthcare. *The New England Journal of Medicine* 1999;340:1677–9.
30. Hannan EL, Siu AL, Kumar D, Kilburn H Jr, Chassin MR. The decline in coronary artery bypass graft surgery mortality in New York State: the role of surgeon volume. *Journal of the American Medical Association* 1995;273:209–13.
31. Begg CB, Cramer LD, Hoskins WJ, Brennan MF. Impact of hospital volume on operative mortality for major cancer surgery. *Journal of the American Medical Association* 1998;280:1747–51.
32. Bach PB, Cramer LD, Schrag D, Downey RJ, Gelfand SE, Begg CB. The influence of hospital volume on survival after resection for lung cancer. *The New England Journal of Medicine* 2001;345:181–8.
33. Cox S. Improving communication between care settings. *Professional Nurse (London, England)* 2000 Jan;15(4):267–71.
34. Mant A, Rotem WC, Kehoe L, Kaye KI. Compliance with guidelines for continuity of care in therapeutics from hospital to community. *Medical Journal of Australia* 2001;174:277–80.
35. Gooding TD, Newcomb L, Mertens K. Patient centered measurement at an academic medical center. *Joint Commission Journal on Quality Improvement* 1999;25:343–51.
36. Goldfrad C, Rowan K. Consequences of discharges from intensive care at night. *Lancet* 2000;355:1138–42.
37. Bell CM, Redelmeier DA. Mortality among patients admitted to hospitals on weekends as compared with weekdays. *The New England Journal of Medicine* 2001;345:663–8.
38. Walraven C. van, Bell CM. Risk of death or readmission among people discharged from hospital on Fridays. *Canadian Medical Association Journal* 2002;166:1672–3.
39. Plsek PE, Greenhalgh T. Complexity science: the challenge of complexity in health care. *British Medical Journal* 2001 Sep;323:625–8.
40. Nyman JA, Sen A, Chan BY, Commins PP. Urban/rural differences in home health patients and services. *Gerontologist* 1991;4:457–66.
41. Hjordtdahl P, Laernum E. Continuity of care in general practice: effect on patient satisfaction. *British Medical Journal* 1992;304:1287–90.
42. Jaakkimainen L. Primary care visits: how many doctors do people see? *Hospital Quarterly* 2001 Fall;5(1):17. Also available from: URL:<http://www.longwoods.com/product.php?productid=16531&page=1>
43. Hutten-Czapski P. President's message: growth in rural doctor numbers in Canada. *Canadian Journal of Rural Medicine* 2002;7:7.

44. Pong RW, Pitblado JR. Beyond counting heads: some methodologic issues in measuring geographic distribution of physicians. *Canadian Journal of Rural Medicine* 2002;7:12–20.
45. Walraven C. van, Rokosh E. What is necessary for high-quality discharge summaries? *American Journal of Medical Quality* 1999;14:160–9.
46. Walraven C. van, Seth R, Austin PC, Laupacis A. Effect of discharge summary availability during post-discharge visits on hospital readmission. *Journal of General Internal Medicine* 2002;17:186–92.
47. Walraven C. van, Seth R, Laupacis A. Dissemination of discharge summaries. Not reaching follow-up physicians. *Canadian Family Physician* 2002;48:737–42.
48. Blann AD, Fitzmaurice DA, Lip GYH. Anticoagulation in hospitals and general practice. *British Medical Journal* 2003;326:153–6.
49. Fugh-Berman A. Herb-drug interactions. *Lancet* 2000;355:134–8.
50. Von Korff M, Glasgow RE, Sharpe M. Organising care for chronic illness. *British Medical Journal* 2002;325:92–94.
51. Nikolaus T, Kruse W, Bach M, Sprecht-Leible N, Ostar P, Schierf G. Elderly patients' problems with medication. *European Journal of Clinical Pharmacology* 1996;49:225–59.
52. Wang PS, Bohn RL, Knight E, Glynn RJ, Mogun H, Avorn JJ. Noncompliance with antihypertensive medications: the impact of depressive symptoms and psychosocial factors. *General Internal Medicine* 2002;17:504–11.
53. Ettlinger PR, Freeman GK. General practice compliance study: is it worth being a personal doctor? *British Medical Journal (Clin Res Ed)* 1981;282:1192–4.
54. Johnson S, Prosser D, Bindman J, Szmukler G. Continuity of care for the severely mentally ill: concepts and measures. *Social Psychiatry Epidemiology* 1997;32:137–42.
55. Weyrauch KF. Does continuity of care increase HMO patients' satisfaction with physician performance? *Journal of the American Board of Family* 1996;9:31–6.
56. Easterbrook M, Godwin M, Wilson R, Hodgetts G, Brown G, Pong R, et al. Rural background and clinical rural rotations during medical training: effect on practice location. *Canadian Medical Association Journal* 1999;160:1159–63.
57. Northern Medical School [Online]. Available from: URL:<http://www.northernmedicalschool.com/>
58. Ryan B. Rural medicine: what role should nurse practitioners play? *Canadian Medical Association Journal* 1998;14:68–9.
59. Grigsby WJ. Telehealth: an assessment of growth and distribution. *Journal of Rural Health* 2002;18:348–58.
60. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH. Collaborative management of chronic illness. *Annals of Internal Medicine* 1997;127:1097–1102.
61. Man-Son-Hing M, Laupacis A, O'Connor AM, Biggs J, Drake E, Yetisir E, et al. A patient decision aid regarding antithrombotic therapy for stroke prevention in atrial fibrillation: a randomised controlled trial. *Journal of the American Medical Association* 1999;282:737–43.
62. Walraven C. van, Laupacis A, Seth R, Wells G. Dictated versus database-generated discharge summaries: a randomised clinical trial. *Canadian Medical Association Journal* 1999;160:3129–26.
63. Walraven C. van, Duke SM, Weinberg AL, Wells PS. Standardised or narrative discharge summaries. Which do family physicians prefer? *Canadian Family Physician* 1998;44:62–9.
64. Paterson JM, Allega RL. Improving communication between hospital and community physicians. Feasibility study of a handwritten, faxed hospital discharge summary. Discharge summary study group. *Canadian Family Physician* 1999;45:2893–9.
65. Nelson JR. The importance of postdischarge telephone follow-up for hospitalists: a view from the trenches. *American Journal of Medicine* 2001;111:43S–44S.
66. Sujansky WV. The benefits and challenges of an electronic medical record: much more than a "word-processed" patient chart. *Western Journal of Medicine* 1998;169:176–83.
67. Mandl KD, Kohane IS, Brandt AM. Electronic patient-physician communication: problems and promise. *Annals of Internal Medicine* 1998;129:495–500.
68. Laerum H, Ellingsen G, Faxvaag A. Doctors' use of electronic medical records systems in hospitals: cross sectional survey. *British Medical Journal* 2001;323:1344–8.
69. Krogstad U, Hofoss D, Hjortdahl P. Continuity of hospital care: beyond the question of personal contact. *British Medical Journal* 2002;324:36–8.
70. Forrest CB, Starfield B. Entry into primary care and continuity: the effects of access. *American Journal of Public Health* 1998;88:1330–6.
71. Commission on the future of health care in Canada: shape of the future: interim report. Commissioner: R. J Romanow. ISBN 0-662-31582-0 Cat. No. CP32-76/2002E-IN. Available from: URL:<http://www.hc-sc.gc.ca/english/care/romanow/index1.html>
72. Ansell JE, Patel N, Ostrovsky D, Nozzolillo E, Peterson AM, Fish L. Long-term self-management of oral anticoagulation. *Archives of Internal Medicine* 1995;155:2185–9.
73. Price C. Point of care testing. *British Medical Journal* 2001;322:1325–8.
74. Oxman AD, Thomson MA, Davis DA, Haynes RB. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. *Canadian Medical Association Journal* 1995;153:1423–31.

75. Davis DA, Taylor-Vaisey A. Translating guidelines into practice: a systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. *Canadian Medical Association Journal* 1997;157:408–16.
76. Worrall G, Chaulk P, Freake D. The effects of clinical practice guidelines on patient outcomes in primary care: a systematic review. *Canadian Medical Association Journal* 1997;156:1705–12.
77. Man-Son-Hing M, Nichol G, Lau A, Laupacis A. Choosing antithrombotic therapy for elderly patients with atrial fibrillation who are at risk of falls. *Archives of Internal Medicine* 1999;159:677–85.
78. Fihn SD, Callahan CM, Martin DC, McDonnell MB, Henikoff JG, White RH, for the National Consortium of Anticoagulation Clinics. The risk for and severity of bleeding complications in elderly patients treated with warfarin. *Annals of Internal Medicine* 1996;124:970–9.
79. Ruoff G, Gray LS. Using a flow sheet to improve performance in treatment of elderly patients with type 2 diabetes. *Family Medicine* 1999;31:331–6.
80. Rundall TG, Shortell SM, Wang MC, Casalino L, Bodenheimer T, Gillies RR, et al. As good as it gets? Chronic care management in nine leading US physician organisations. *British Medical Journal* 2002;325:958–61.
81. Grimshaw JM, Shirran L, Thomas R, et al. Changing provider behavior: an overview of systematic reviews of interventions. *Medical Care* 2001;39:112–45.
82. Grol R. Improving the quality of medical care: building bridges among professional pride, payer profit, and patient satisfaction. *Journal of the American Medical Association* 2001;286:2578–85.
83. Beyth RJ, Quinn L, Landefeld CS. A multicomponent intervention to prevent major bleeding complications in older patients receiving warfarin: a randomised controlled trial. *Annals of Internal Medicine* 2000;133:687–95.
84. Grone O, Barcia-Barbero M. Integrated care: a position paper of the WHO European office for integrated health care services. *International Journal of Integrated Care* [serial online] 2001;1. Available from: URL:<http://www.ijic.org/>
85. Kodner DL, Spreeuwenberg C. Integrated care: meaning, logic, applications, and implications: a discussion paper. *International Journal of Integrated Care* [serial online] 2002 Nov 14;2. Available from: URL:<http://www.ijic.org/>
86. Albers GW, Calen JE, Laupacis A, Manning WJ, Petersen P, Singer DE. Antithrombotic therapy in atrial fibrillation. *Chest* 2001;119:194S–206S.
87. Worrall G, Chaulk P, Freake D, Kerrivan T. Attitudes of rural family physicians to clinical practice guidelines: a cross-sectional survey. *Canadian Journal of Rural Medicine* 1996;1:71–9.
88. McAlister FA, Campbell NRC, Zarnke K, Levine M, Graham ID. The management of hypertension in Canada: a review of current guidelines, their shortcomings and implications for the future. *Canadian Medical Association Journal* 2001;164:517–22.
89. Shaneyfelt T, Mayo-Smith MF, Rothwangle J. Are guidelines following guidelines? The methodological quality of clinical practice guidelines in the peer-reviewed medical literature. *Journal of the American Medical Association* 1999;281:1900–05.
90. Weingarten SR, Henning JM, Badamgarav E, Knight K, Hasselblad V, Gano A Jr, et al. Interventions used in disease management programmes for patients with chronic illness-which ones work? Meta-analysis of published reports. *British Medical Journal* 2002;325:925.
91. Epstein RS, Sherwood LM. From outcomes research to disease management: a guide for the perplexed. *Annals of Internal Medicine* 1996;124:832–7.
92. Ansell J, Dalen J, Bussey H, Anderson D, Poller L, Jacobsen A, et al. Managing oral anticoagulant therapy. *Chest* 2001;119:22S–38S.
93. Gaughan GL, Dolan C, Wilk-Rivard E, Geary G, Libbey R, Gilman MA, et al. Improving anticoagulation of atrial fibrillation and anticoagulation in a community hospital. *Journal of Quality Improvement* 2000;26:18–28.
94. Cohen IA, Hutchinson TA, Kriking DM, Shue ME. Evaluation of a pharmacist-managed anticoagulation clinic. *Journal of Clinical and Hospital Pharmacy* 1985;10:167–75.
95. Ellis RF, Stepohens MA, Sharp GB. Evaluation of a pharmacy-managed warfarin-monitoring service to coordinate inpatient and outpatient therapy. *American Journal of Hospital Pharmacy* 1992;49:387–94.
96. Fitzmaurice DA, Hobbs FD, Murray ET, Holder RL, Allan TF, Rose PE. Oral anticoagulation management in primary care with the use of computerised decision support and near-patient testing: a randomised controlled trial. *Archives of Internal Medicine* 2000;160:2343–8.
97. Waterman AD, Banet G, Milligan PE, Frazier A, Verzino E, Walton B, et al. Patient and physician satisfaction with a telephone-based anticoagulation service. *Journal of General Internal Medicine* 2001;16:460–3.
98. Pearson SD, Goulart-Fisher D, Lee TH. Critical pathways as a strategy of improving care: problems and potential. *Annals of Internal Medicine* 1995;123:941–8.
99. Campbell H, Hotchkiss R, Bradswah N, Porteous M. Integrated care pathways. *British Medical Journal* 1998;316:133–7.
100. Marrie TJ, Lau CY, Wheeler SL, Wong CJ, Vandervoort MK, Feagan BG. A controlled trial of a critical pathway for treatment of community-acquired pneumonia. CAPITAL Study Investigators. Community-Acquired Pneumonia Intervention Study Trial Assessing Levofloxacin. *Journal of the American Medical Association* 2000;283:2654–5.

101. Balas EA, Jaffrey F, Kuperman GJ, Boren SA, Brown GD, Piniciroli F, et al. Electronic communication with patients. Evaluation of distance medicine technology. *Journal of the American Medical Association* 1997;278:152–9.
102. Jong MKK, Horwood K, Robbins CW, Elford R. A model for remote communities using store and forward telemedicine to reduce healthcare costs. *Canadian Journal of Rural Medicine* 2001;6:15–20.
103. Herbermann M. Building a seamless system of hospital-home health services. *Seminars for Nurse Managers* 2000 Mar;8(1):20–5.
104. Chao J. Continuity of care: incorporating patient perceptions. *Family Medicine* 1988;20:333–7.
105. Bull MJ, Luo D, Maruyama GM. Measuring continuity of elders' posthospital care. *Journal of Nursing Measurement* 2000;8:41–60.
106. Coleman EA, Smith JD, Frank JC, Eilertsen TB, Thiare JN, Kramer AM. Development and testing of a measure designed to assess the quality of care transitions. *International Journal of Integrated Care* [serial online] 2002;2. Available from: URL:<http://www.ijic.org/>
107. Kowalyk KM, Hadjistavropoulos HD, Biem HJ. Measuring continuity of care for cardiac patients: development of a patient self-report questionnaire. *The Canadian Journal of Cardiology* 2004 Feb;20(2):205–12.
108. Slater B, Cornforth J. Continuity of care on admission to hospital: an audit of Airedale NHS Trust's transfer policy. *International Journal of Health Care Quality Assurance* 1996;9:34–7.
109. Dellasega C, Orwig D, Ahern F, Lenz E. Postdischarge medication use of elderly cardiac patients from urban and rural locations. *Journals of Gerontology Series A Biological Sciences and Medical Sciences* 1999;54:M514–20.