Using Visual Methods to Capture Patient Perspectives in Interprofessional Team-Based Care for Chronic Disease Management

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Abstract

Background: Understanding how patients perceive their role in the healthcare team can improve overall satisfaction of care and health outcomes. However, it has been challenging to capture the diversity of patient experiences using traditional research approaches. The goal of this study was to explore the perspectives of patients involved in an interprofessional team-based chronic disease management program for chronic obstructive pulmonary disease using visual research techniques.

Methods: Our visual approach began with patients autonomously drawing (or mapping) experiences with their healthcare team. The maps were explored with the patients through focus group discussions. Maps were inductively coded to identify similarities and differences between participants' perceptions. Focus group transcripts were first analyzed independently, then compared to and integrated into the map analysis.

Findings: Overall, participants (*n* = 13) were satisfied as patients of team-based care. Participants drew multiple healthcare providers, sources of information, and themselves to represent their teams. Relationships and significance were represented using arrows, the size of each team member, facial expressions, and symbols. Four key elements of effective team-based models of care emerged: 1) effective information sharing, 2) diversity of providers' roles, 3) empowerment through self-management, and 4) enhanced access to care.

Conclusion: This study used visualization methodology to obtain patient feedback on the program's performance, elicit patients' experiences, and attempt to mitigate some of the limitations of isolated survey and focus group methodology, subsequently obtaining rich data on team-based care. Our research also informs ongoing quality improvement of the team-based model for chronic disease management.

Keywords: interprofessional team-based care, chronic disease, quality improvement, visual mapping

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Introduction

Patient feedback is recognized as a prerequisite to patient-centered care [1] and is acknowledged as critical to setting priorities for healthcare. This is particularly true in the context of interprofessional teams providing chronic disease support, where teams can be complex and where health outcomes are dependent on patient engagement and adherence.

Increasing medical specialization, complexity of patient needs, and the ever-changing landscape of healthcare has led to the creation of interprofessional and multiprofessional teams in chronic disease management. While terminology surrounding teams in chronic disease management is sometimes used inconsistently or interchangeably, there are notable differences in the team structure and dynamics. Interprofessional collaboration in healthcare refers to highly integrative, coordinated care provided by independent allied health professionals where there is often collaborative planning and "shared ownership" of a comprehensive care plan [2,3]. Multidisciplinary teams, on the other hand, have been described as structurally hierarchical, consisting of allied health professionals who share information primarily through electronic medical records, with few in-person interactions [2]. Interprofessional teamwork has been shown to improve patient outcomes [4-6], increase provider satisfaction [7-11], decrease health services utilization, and improve resource efficiency [11-12]. However, teamwork is a complex phenomenon that is shaped by the interplay of numerous individual, interpersonal, task-related, organizational, and societal factors [13-15]. This complexity may be further compounded in interprofessional teams by differences in training backgrounds as well as with limited in-person interaction between providers with the need for coordinated care. As a result, sophisticated evaluation strategies are required to evaluate team functioning.

Furthermore, in chronic disease management, patients are not only the recipient of team care but are members of the collaborative care team [1]. Their role often includes making treatment decisions, bridging communication between providers, managing multiple appointments, and self-advocacy. Including patients as team members is important for direct care, and also for the development and implementation of care programs. Yet, the current repertoire of evaluative instruments used to elicit patients' experiences about their healthcare team is limited [16]. Surveys and questionnaires are frequently used to report general patient satisfaction [17]. Although self-report tools are easy to administer, their limitations are widely documented, including self-report bias [18], difficulty in distinguishing between specific components of care [19], conflation of patient "satisfaction" with more informative patient "experience" [20], and problematic survey design and administration [21].

Interviews and focus groups are also commonly used to create patient narratives of their experience. While these narratives may be better suited to explore the nuances of individual experiences, they are vulnerable to verbal barriers and group phenomena [22]. Verbal communication poses inherent challenges to gathering data on complex experiences, as individuals tend to describe concrete events in a lin-

ear fashion (i.e., giving a play-by-play account) rather than speak about the more subtle, interacting, and underlying factors [18]. Focus groups are limited by moderator effects and shifts toward dominant voices that may prevent researchers from accurately capturing all voices and perspectives [22]. Focus groups may also reproduce normative discourses when controversial perspectives or unpopular opinions are obscured by dynamic group interactions in evaluating patient perspectives on interprofessional teams [23]. Surveys, interviews, and focus groups can still be effective, however, despite these minor limitations. The common benefits and limitations of prominent tools are illustrated in the discussion section.

Amidst these issues, we suggest adding visual methods to other evaluation tools, like focus groups, to develop a rich picture of how patients perceive their interprofessional healthcare teams. Incorporating the use of visual methods in health sciences research can help facilitate participants' thinking, storytelling, and reflection [24]. Visual methods, such as mapping, can augment other tools to create a more comprehensive, individual, and malleable perspective of team-based chronic disease care.

Rich pictures

A common visual method is the rich pictures approach [25]. Rich pictures vary in their artistic and relational complexity, but they offer researchers the chance to see in detail how relationships and situations are perceived from a uniquely individual perspective [26]. A rich picture can be analyzed as a whole or as constituent parts, as well as used to promote and drive dialogue. Rich pictures were first used in academia by Peter Checkland, stemming from Soft Systems Methodology (SSM) in systems engineering [27]. The use of rich pictures has since been included as part of the SSM to help inquirers in a variety of fields understand the complexity of interpersonal relationships in sophisticated and contextual environments [28]. Rich pictures in Checkland's SSM approach are literal pictures often drawn to visually describe human activity and crucial relationships in a complex situation [28]. In this study, these drawings were produced by the participants based on their personal experiences with a chronic disease management program. Rich pictures are especially valuable as a basis for discussion between researchers and patients as they allow researchers to investigate, clarify, or correct any misconceptions by presenting their understanding of the situation and asking for feedback. Since the development of SSM, many qualitative researchers have adopted rich pictures as a method of data collection [25,26,29]. For example, Cristancho, Bidinosti, Lingard, Novick, Ott, and Forbes [28] used rich picture methodology to capture perceptions of the operating room from patients' perspectives. Doing so allowed researchers to a gain deeper understanding of the individual surgical experience and decision-making process in the operating room, thus allowing for better engagement with patients and enhanced co-production of healthcare improvement.

The aim of our study was twofold: to assess the utility of rich pictures in eliciting patient feedback in the context of interprofessional, chronic disease team management, and to perform a quality improvement evaluation by examining the team

dynamics, collective experience, and patients' perspectives in a chronic disease management program. Our study looked specifically at patients participating in The Best Care COPD (BCC) program, which is located in Southwestern Ontario, Canada and serves patients with lung disease (in particular chronic obstructive pulmonary disease [COPD]) through a team-based interprofessional approach. This model includes respiratory therapists (RTs), primary care clinicians (nurse practitioners and physicians), and nurses. Through the BCC program, patients receive high quality, evidence-based care including education, skills training, self-management, and advanced care planning. All visits occur in the usual primary care practice supported by an electronic point-of-service system that has been developed to conform to national and international guidelines to support, prompt, and standardize evidence-based care [30-32]. By using visual methods to bolster our understanding of patient-centered care, there is an opportunity to provide constructive feedback to program planners and service developers, possibly leading to optimized delivery designs that are founded on patients' perspectives.

Methods

The preparation of this manuscript was guided by SQUIRE 2.0, which assisted in the transparent reporting of our findings on how to examine team dynamics, collective experience, and perspectives of patients [33] (Appendix 1). We conducted a focus group that included rich picture generation to gather an in-depth understanding of patient perspectives of their healthcare team, the role patients have in decision-making, and the ideal role patients wanted to have in their care. Focus groups were also conducted with providers; however, this article focuses only on patient data. Data collection took place in Southwestern Ontario, Canada as part of a large evaluative study of the BCC program. The focus groups began with discussion about their healthcare team and around patient experience with their care. The visual technique to create a rich picture "team map" was done a third of the way through the focus group. These pictures served two functions: 1) as mind maps (or conceptual drawings) to guide the discussion, and 2) as raw data that were analyzed to deepen our understanding of team functioning. After being instructed to describe their team and where they were positioned relative to their providers, participants independently drew their conceptions on a blank piece of paper. The researchers then asked the participants to explain these rich pictures, with particular emphasis on the drawing of their own persons, members of their healthcare team, and their relative positioning.

   Focus groups were audio-recorded and then transcribed. Analysis was supported by NVivo 10 software. Data was analyzed and coded using a thematic approach. Maps and focus groups were first analyzed independently, then in aggregate. First, we conducted an inductive and aesthetic analysis of each drawing. The aesthetic analysis was guided by Cristancho et al. whereby bottom-up descriptions of the rich picture drawings were developed [28]. This bottom-up approach first considered identification of visual elements of the rich pictures and how they were connected. Shapes, lines, scale, emphasis, focal points, and space were highlighted during this

process. This was followed by consideration of the meaning of motifs separately and in relation to other aspects of the rich picture team maps. Identifying motifs and relational connections between motifs allowed for the identification of potential stories and contexts surrounding the patient experience. The inductive aesthetic analysis was followed by a comparative analysis of multiple drawings where we looked for similar elements and motifs within the maps such as shapes as well as the position of key players (i.e., patients, RTs, physicians) [34]. While Checkland's SSM would require the development of an amalgamated rich picture [26], Cristancho et al.'s application and analysis of rich pictures provided an adapted approach well suited for complex healthcare settings [28]. Lastly, the analysis of maps was overlaid with analysis of the focus group transcripts to explore conforming and divergent ideas, as well as new emerging themes.

Results

Thirteen patients across four focus groups participated in the study. Fifteen rich pictures depicting patients' perceptions of interprofessional care teams were collected (two patients submitte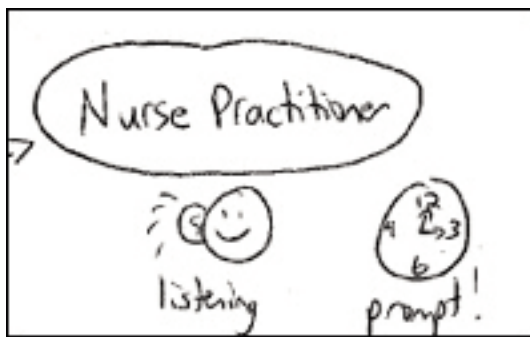d two pictures each). The majority of pictures generally contained smiling faces and positive comments, suggesting overall high levels of patient satisfaction towards their care team. Focus groups echoed this high level of satisfaction: "She's never disappointed me, ever, not once. You can rely on her" (FG #3). Patients described provider attributes associated with positive feedback including strong listening skills, effective and transparent communication with patients, and the ability to make others feel at ease. Patients depicted healthcare providers engaging in activities utilizing these skills through drawings of an extended ear along with written positive comments (Figure 1).

Figure 1: "Listening Ear" (Pt #12)

Four key elements of effective team-based models of care emerged: 1) effective information sharing, 2) diversity of providers' roles, 3) empowerment through self-management, and 4) enhanced access to care. The results are presented with verbatim and illustrative quotes from focus groups, and examples from the patient perspective maps.

Effective information sharing

Information sharing was a key idea seen in maps and discussed in focus groups. Open books alongside pictures of care providers with arrows flowing to, from, and bidirectionally were shown in the pictures. Three pictures also featured drawings of internet and book resources. Information sharing was demonstrated in the pictures, showing the patients sitting with their providers alongside an open book representing knowledge (Figure 2a). Pictures differed in the placement of the information source and the care provider. For some pictures, the provider was closely positioned to the information, suggesting a connection between the two. In others, there was a separation between the information source and the provider. This idea was explored
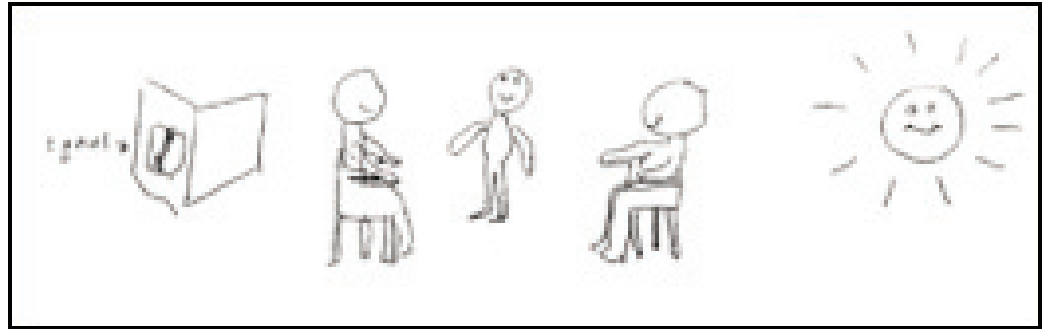
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Figure 2a: Sharing information together (Pt #1)

during the focus group. Participants described how much they valued getting useful information from their provider, which helped them manage their care:

> then I transferred over to [the BCC Program]. And I was sick a couple of times, I will admit that. … I didn't know when to take [my medication]. I was sick, sick, sick, and here I was supposed to take them. So, I talked to [my RT] and he wrote down everything step by step, so if it ever happened again, I'm prepared. (FG #5)

As demonstrated in this quote, this patient found that the program was able to provide more comprehensive medication education not otherwise obtained in their previous care, therefore preparing them to better self-manage medical events.

Participants also expressed frustration with having to access information from multiple sources. Focus group discussions explored this frustration. Aspects of their care were often piecemeal and decentralized, requiring them to seek information from a variety of sources (Figure 2b).

Figure 2b: Seeking information on my own (Pt #10)

In addition, participants sometimes felt that there was insufficient information sharing amongst healthcare providers. For example, when information that should have been in the patient's file was not there, extra time was required for clarification between healthcare providers.

> Like I say, a little communication [would be helpful]… because I've noticed a couple of times where [the RT] isn't up [to date] on something I told [my family doctor], but he'll [the RT] go right out and double-check on it. But I don't think that [the RT] should have to, I think that information should have been available to him. (FG #5)

Diversity of providers' roles

Roles represented in participants' pictures included the physician, the receptionist, the nurse practitioner, the pharmacist, and the RT. Physicians and pharmacists were usually drawn alongside medications. The physician was most commonly drawn on the periphery of the team maps, often depicted with a serious (non-smiling) face. A few pictures had arrows originating from the doctor towards other professionals, suggesting the doctor as a gatekeeper to specialist services (Figure 3a). When asked about the role of healthcare providers during the focus group, participants discussed a moderate level of satisfaction, largely because it was often hard to get an appointment with their physicians. However, participants explained that during the actual appointment, they felt that they received adequate and personalized care.

> You do have to wait but I understand it. Because [GP #3] will not take any new patients [be]cause he's full up to the brim now. But when he sees you, you're the only person in the world and he'll see you as long as necessary. That's why you have to wait but I understand it. (FG #3)
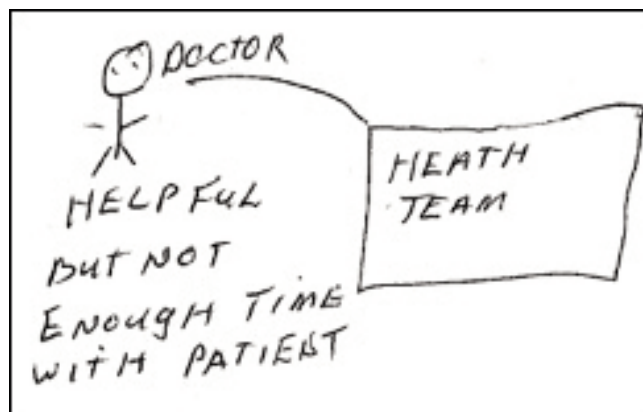

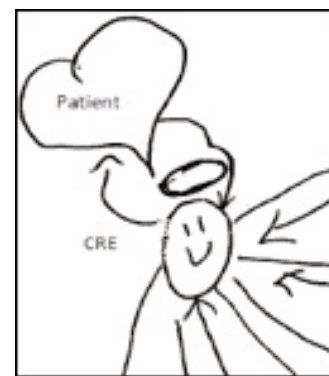**Figure 3a: Lack of time
with patient (Pt #9)**

**Figure 3b: The RT as
an angel with lots of
information flow (Pt #4)**

RTs depicted in pictures were always drawn in a positive way, for example with halos and smiling faces (Figure 3b). RTs were also often placed in a prominent position in the pictures, either at the centre or as a large figure off to the side. In some maps, the RT was the central figure within the team and appeared to coordinate the team. RTs often had several arrows flowing both to and from them, indicating the patients' perception of them as an information conduit. Through discussions in focus groups, it was clear participants felt RTs were available to support patient needs, often at "any time of day." Participants described how RTs supported effective communication between different health professionals, the healthcare team, and the patient.

Medical receptionists, when represented, were depicted with a smiling face, with positive comments, and descriptions such as being "very helpful." This depiction suggests an important, yet often unrecognized, role of the receptionist in team-based care. Focus group dialogue confirmed this.

The receptionists here are very helpful, if you call and you need to come in … and initially, I missed that, because now when I call, it's always a different person, I don't have that same relationship with my initial contact with the office, but I've found that the benefits far outweigh that. [I understand] that I just have to know that whoever I'm talking to, doesn't know me, so I have to be very clear and be an advocate [for myself]. But the option to see many people and to see them promptly means more to me than having that personal connection of just the secretary and the family doctor. (FG #5)

Other professionals included in the rich pictures were the pharmacist, insurance companies, and the lab. A few pictures depicted the nurse practitioner as being a particularly helpful and supportive individual. These were added to patients' maps without being distinguished as key members of the team, most often included as a list to the side. These other roles were also not frequently discussed in focus groups. However, it is clear for patients that their healthcare team is broader than the providers they see at the clinic.

Empowerment through self-management

The patient pictures and focus group discussions highlighted the heterogeneity of the patient group in how they understood their role in their healthcare team. For instance, some pictures showed patient participation as central in treatment planning with drawings of the patient at the very center of the picture. This was echoed in focus group discussions where participants felt empowered and at the center of their care.

[My RT has taught me] to be more responsible for my own health, because I can just sort of ignore lots of signs, and then all of a sudden, oh my goodness, I'm in big trouble. And it's funny that I said to her last time we met, because we have a regular standing appointment, I should want to take care of my own health for myself, but it's like, I want to please her, I want to do all the things I'm supposed to be doing, so that I think I'm going to have great readings when I get tested by her. It's kind of a funny thing as an adult to say that, but she's just helped me to be a lot more proactive than I was before. (FG #4)
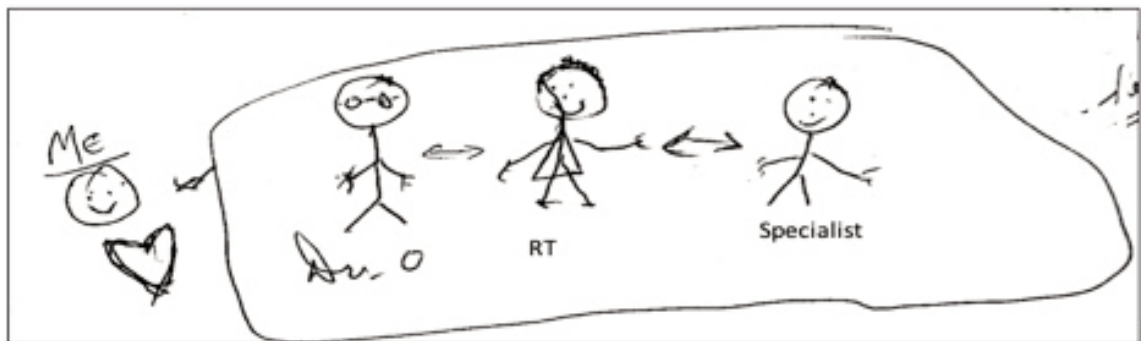

Figure 4: Patient outside of the team (Pt #2)

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However, other pictures indicated a less prominent role played by patients, for example by having the patient depicted as off-center, small, and isolated relative to the other members of the team. A participant expressed their interpretation of what interprofessional teams means to them when asked about this off-center placement on their map. "When you say team, I'm thinking of doctors. Those people. I'm a patient. I'm not a part of the team" (FG #3) (Figure 4). Most participants acknowledged that, as patients, they need to have a role in their care.

Enhanced access to care

The rich pictures showed interprofessional teams as facilitators to accessing care outside their regular visits, by showing straight lines to their care provider and dotted lines to providers outside of that team. During the focus group, participants discussed accessibility and continuity of care as including both geographical convenience to the clinic as well as timely access to their provider (i.e., not having to wait in the clinic and getting through when making phone calls).

> Well, when you're at home and you're really sick, you can call her, and she'll tell you if you should come in and see her or [the GP] or go to the hospital. But they don't tell me to do that because they know I won't most of the time. (FG #3)

In the pictures, various methods of accessing their care were expressed by drawing a phone (Figure 5a and 5b).
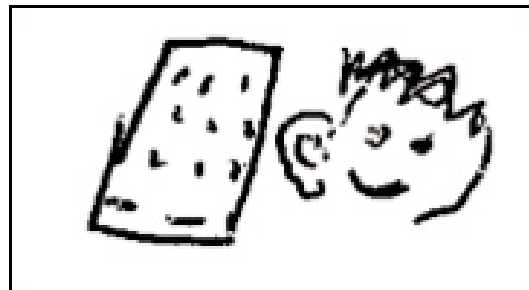

Figure 5a: Phone anytime (Pt #14)

Figure 5b: The RT is available (Pt #3)

Discussion

The results of this study both support the feasibility of using visual techniques in interprofessional practice research, especially as a tool to complement other evaluation approaches, and add to the literature by providing information on areas of team-based care important to patients. Several additional key insights were uncovered. The limited time physicians spend with patients may affect patient satisfaction. However, this drawback may be mitigated by care provided by other members of the interdisciplinary team. Further, through our analysis, we uncovered some often-undiscussed parts of interprofessional care, such as the role of medical receptionists. Visual mapping and rich pictures have been exemplified in this study as a way to drive discussion with patients that is centered around their perspectives. Visual

maps and rich pictures are easy to administer and act as a canvas for patients to present a broad spectrum of ideas to researchers. This contrasts with tools like questionnaires, which are more rigid in nature and based on pre-determined criteria, or interviews, in which the spoken medium can promote the discussion of linear and concrete events over interacting, simultaneous, and dynamic factors. Given the varied and causal nature of COPD, traditional measures of capturing care satisfaction need to instead make way for capturing the various aspects of their illness experience [35]. As well, experiences do not only vary between patients, but also at different milestones of their journey, from their initial diagnosis to their day-to-day care, and towards their end of life [36]. With visual maps and rich pictures, facilitators are better able to capture perspectives that fall outside the scope of other tools. Using pictures allowed participants in our study to independently express their perspectives of their care. Drawings were conducted after a few broad questions about their team (this allowed patients to first think about their team and their experience with

Table 1: Landscape of common tools

Method	Limitations	Advantages
Survey/ Questionnaire	Highly structured; rigid	Easily administered
	Self-report bias	Allows statistical generalization
	Difficulty distinguishing components of care	Participant responses collected for all standardized questions
	Problematic design and administration	
Focus Groups	Verbal barriers	Collective sense-making/co-construction of ideas
	Group phenomenon	Time and cost savings
	Linear	Access to hard-to-reach groups (security in numbers)
	Miss subtle interesting findings	May inform survey instruments and culturally sensitive methodologies
	Moderator effects	
	Dominant voices	
	Group dynamics interactions	
Rich Picture Method	Complex and time-consuming level of analysis	Afforded time to reflect
	Drawings may be unstructured, conflicting, and confusing to interpret	Supports visual expressions in people with limited language skills
	Limited guidance in the literature to conduct a structured/standardized analysis across groups	Able to gather information that might not be captured using structured tools
		Graphically rich
		Unstructured/malleable
		Able to independently express their perspectives prior to being exposed to the opinions of others in the focus groups
		Serves as a source of complementary data

their team); however, further discussion and in-depth discussion about their experience, hopes, and expectations occurred after the mapping exercise with an aim to limit possible group phenomena or bias [22]. In previous iterations of our work, we conducted the drawing exercise first; however, we found this led to many questions and lack of clarity from participants. By having discussions prior to drawing, participants seemed more confident in constructing their pictures and the exercise took less time to explain and conduct. From a logistical standpoint, rich pictures are less resource-intensive and are easy to administer as a data collection tool compared to surveys and questionnaires. Table 1 illustrates the landscape of common tools available to health systems researchers.

Our results found several important areas for successful interprofessional team-based care. First, patients appreciate physicians are "busy"; they also appreciate when care team members take time to listen and support their care. While physicians may not always have sufficient time, other team members may. This diversity of roles for healthcare providers is important for successful models of team-based care. Spending sufficient time with patients is critical for successful team-based care, including initial point of contact, such as simply getting through to arrange an appointment. Insufficient time with a provider or having difficulty with accessing their team may contribute to negative overall feelings towards the care patients receive. This finding is supported by earlier research that associated prolonged physician visits with higher patient satisfaction [37]. Batbaatar, Dorjdagva, Luvsannyam, Savino, and Amenta [37] suggest that higher patient satisfaction with their healthcare team and services contributes to better health outcomes through changing patients' behavioral intentions, such as adherence to doctors' treatment recommendations and follow-ups with medical appointments.

An additional compelling finding of this study is the importance of medical receptionists in the functioning of successful team-based care. As patients' first and last point of contact and as gatekeepers to appointments, medical receptionists play a key part in representing the healthcare team and facilitating the patient experience [4]. Their interactions with patients consequently can strengthen the relationship between the healthcare team and the patient, especially as high-quality interpersonal interactions (active listening, empathy, sincerity, and complimenting) in the healthcare sphere have been found to be strongly related to positive patient experience [38,39]. Despite their crucial role in supporting the quality of care and patient experience, the role of medical receptionists is often overlooked in team-based care approaches [4].

Our results support the idea that patients' access to health services and clinical information may impact their level of satisfaction towards their care team [37,40]. Effective and transparent communication between health providers and patients, as well as greater accessibility of care, contribute to positive patient experiences [41]. In our study, participants talked about instances where patient information was not up to date to the effect that it delayed care. This has been shown to lead to errors in the absence of strong patient self-advocacy [42]. Our research confirms that patients often require assistance with their chronic diseases even outside their regular

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appointments. Interprofessional chronic disease management teams should facilitate information sharing amongst a patient's entire healthcare team and work with patients to "define their team" including a discussion of individual perspectives and their role in the care team. Action plans including information such as "when, how, and with whom" would also improve overall integrated and coordinated care. More research with both providers and patients together could explore how these key characteristics can be best explored in the practice of interprofessional team-based care for chronic disease management.

The results gathered using visual methods approach also reinforces the effectiveness of the BCC program, especially in delivering a more comprehensive care plan for patients. Although this cannot be generalized to other interprofessional team-based chronic disease management programs, this study demonstrates the potential of the rich pictures methodology to obtain data that may supplement future qualitative research studies.

Limitations

Social desirability bias present during focus groups is a possible limitation. In our study, when constructing their team maps, participants may have consciously or unconsciously provided responses that appeared to be socially acceptable, instead of drawing maps that reflect their true perceptions of the roles of different healthcare providers within the interprofessional care team [40].This is not a new revelation. Checkland and Poulter [26] note that these drawings are never fully complete, since understandings of complex situations continue to grow through investigation.

The small sample size is another limitation of this study; the findings of this study only represent the perspectives of this specific set of patients and may lack generalizability. Our small sample size allowed us to conduct in-depth analyses of the maps drawn by each participant, which may not have been feasible to perform with a large sample.

Given the unique nature of the BCC program, both in its demographic and structure, the results obtained using rich pictures methodology should be narrowly interpreted and may not apply to other interprofessional team-based models of care.

Conclusion

This study helps to uncover the nuances of this interprofessional, team-based care program. Specifically, the benefits associated with effective information sharing, diversity in roles, empowerment through self-management, and enhanced access to care prove to be beneficial for patients. As well, the effectiveness of visual maps to explore patient experiences with chronic disease management has been exemplified through this study. Visual maps are malleable and unstructured in nature, a benefit over more structured traditional data collection tools. In this study, patients discussed issues and perspectives that may not have otherwise surfaced. We believe the rich picture approach can help patients articulate their place in self-management. However, more research is needed to determine if the pictures alone are sufficient in assessing patient perception of their care and engagement with their healthcare team. During our focus groups, we conducted a rich picture process both to act as visual data and to support generative discussion. Integrating perspectives from the

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patients about their satisfaction with the care received, their perceived roles as patients, and other interpersonal relationships also allows researchers to obtain a fuller picture of perceived challenges to interprofessional collaboration. This study also supports the viability of rich pictures visual methodology to support the BCC program; based on prevailing sentiment from participants, there is strong support to scale this successful COPD management program in the future. Further research should be conducted on how to best scale visualization methodology to both improve and transform chronic disease management, as well as explore how to conduct this approach through an online medium.

Acknowledgement

Abbreviations

BCC: Best Care COPD
COPD: Chronic Obstructive Pulmonary Disease
FG: Focus Group
RT: Respiratory Therapist
SSM: Soft Systems Methodology

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Appendix 1

Revised Standards for Quality Improvement
Reporting Excellence (SQUIRE 2.0) September 15, 2015

Text section and item name	Section or item description	
Notes to authors	• The SQUIRE guidelines provide a framework for reporting new knowledge about how to improve healthcare • The SQUIRE guidelines are intended for reports that describe system level work to improve the quality, safety, and value of healthcare, and used methods to establish that observed outcomes were due to the intervention(s). • A range of approaches exists for improving healthcare. SQUIRE may be adapted for reporting any of these. • Authors should consider every SQUIRE item, but it may be inappropriate or unnecessary to include every SQUIRE element in a particular manuscript. • The SQUIRE Glossary contains definitions of many of the key words in SQUIRE. • The Explanation and Elaboration document provides specific examples of well-written SQUIRE items, and an in-depth explanation of each item. • Please cite SQUIRE when it is used to write a manuscript.	
Title and abstract	*Why did you start*	
1. Title	Indicate that the manuscript concerns an initiative to improve healthcare (broadly defined to include the quality, safety, effectiveness, patient-centered-ness, timeliness, cost, efficiency, and equity of healthcare)	Page 1
2. Abstract	a. Provide adequate information to aid in searching and indexing b. Summarize all key information from various sections of the text using the abstract format of the intended publication or a structured summary such as: background, local problem, methods, interventions, results, conclusions	Page 2
Introduction	*Why did you start?*	
3. Problem description	Nature and significance of the local problem	Page 3
4. Available knowledge	Summary of what is currently known about the problem, including relevant previous studies	Page 4
5. Rationale	Informal or formal frameworks, models, concepts, and/or theories used to explain the problem, any reasons or assumptions that were used to develop the intervention(s), and reasons why the intervention(s) was expected to work	Page 3-4
6. Specific aims	Purpose of the project and of this report	Page 3-4
Methods	*What did you do?*	
7. Context	Contextual elements considered important at the outset of introducing the intervention(s)	Page 4-5
8. Intervention(s)	a. Description of the intervention(s) in sufficient detail that others could reproduce it b. Specifics of the team involved in the work	Page 4-5
9. Study of the intervention(s)	a. Approach chosen for assessing the impact of the intervention(s) b. Approach used to establish whether the observed outcomes were due to the intervention(s)	Page 4-5

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Appendix 1 (continued)

Methods	*What did you do?*	
10. Measures	a. Measures chosen for studying processes and outcomes of the intervention(s), including rationale for choosing them, their operational definitions, and their validity and reliability b. Description of the approach to the ongoing assessment of contextual elements that contributed to the success, failure, efficiency, and cost c. Methods employed for assessing completeness and accuracy of data	Page 4-5
11. Analysis	a. Qualitative and quantitative methods used to draw inferences from the data b. Methods for understanding variation within the data, including the effects of time as a variable	Page 4-5
12. Ethical considerations	Ethical aspects of implementing and studying the intervention(s) and how they were addressed, including, but not limited to, formal ethics review and potential conflict(s) of interest	N/A
Results	*What did you find?*	
13. Results	a. Initial steps of the intervention(s) and their evolution over time (e.g., time-line diagram, flow chart, or table), including modifications made to the intervention during the project	N/A
	b. Details of the process measures and outcome	Page 5-8
	c. Contextual elements that interacted with the intervention(s)	Page 5-8
	d. Observed associations between outcomes, interventions, and relevant contextual elements	N/A
	e. Unintended consequences such as unexpected benefits, problems, failures, or costs associated with the intervention(s).	N/A
	f. Details about missing data	N/A
Discussion	*What does it mean?*	
14. Summary	a. Key findings, including relevance to the rationale and specific aims b. Particular strengths of the project	Page 8-10
15. Interpretation	a. Nature of the association between the intervention(s) and the outcomes	N/A
	b. Comparison of results with findings from other publications	N/A
	c. Impact of the project on people and systems	Page 9-10
	d. Reasons for any differences between observed and anticipated outcomes, including the influence of context	N/A
	e. Costs and strategic trade-offs, including opportunity costs	N/A
16. Limitations	a. Limits to the generalizability of the work	Page 10
	b. Factors that might have limited internal validity such as confounding, bias, or imprecision in the design, methods, measurement, or analysis	N/A
	c. Efforts made to minimize and adjust for limitations	N/A
17. Conclusions	a. Usefulness of the work	Page 9-10
	b. Sustainability	N/A
	c. Potential for spread to other contexts	Page 9-10
	d. Implications for practice and for further study in the field	Page 9-10
	e. Suggested next steps	Page 9-10
Other information		
18. Funding	Sources of funding that supported this work. Role, if any, of the funding organization in the design, implementation, interpretation, and reporting	Page 15