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CHARACTERIZING, ASSESSING AND IMPROVING HEALTHCARE REFERRAL COMMUNICATION

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Dissertation

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By

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A

DISSERTATION

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by

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DEDICATION

To

my loving wife, Nitzia, for her patience and understanding
my son and daughter, Andres and Sofia, who are my reasons to succeed
my parents, Blanca and Nicolas, for instilling the importance of hard work and education
my brother, Nicolas, who inspires me to grow and evolve
my friends and colleagues, whose advice helped me get to this point
my extended family, may you also be motivated and encouraged to reach your dreams.

PREFACE

The three journal articles included in this work have been submitted for peer review and consideration for publication.

1. The article titled “Referrals in Healthcare: A Concept Analysis” was submitted to the journal of Health Services Research.
2. The article titled “A Mixed-Method Framework to Evaluate Referrals in Healthcare” was submitted to the journal of Health Services Research.
3. The article titled “When your words count: A discriminative model to predict referral’s approval by specialty services” was submitted to the British Medical Journal.

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Introduction

A healthcare referral is a common and important component of primary care. Healthcare providers often refer their patients to other services or providers to obtain advice on diagnosis or management, to obtain a specialized procedure, or to obtain a second opinion. Almost a third of all visits to primary care providers in the United States will result in referrals to specialty services. As with other healthcare processes, referrals are susceptible to breakdowns. These breakdowns in the referral process can lead to poor continuity of care, slow diagnostic processes, delays and repetition of tests, patient and provider dissatisfaction, and can lead to a loss of confidence in providers. These facts and the necessity for a deeper understanding of referrals in healthcare served as the motivation to conduct a comprehensive study of referrals.

Three manuscripts are presented as a PhD dissertation for the study and evaluation of referrals in healthcare. The researched combined the study of referrals as an abstract concept in order to establish a conceptual definition and a model with a real world study of referral communication at a large county hospital system. The large county hospital system was chosen because of their commitment to developing and implementing a centralized referral center in order to improve their referral processes. The goals of studying, evaluating and improving referrals shared by the researcher and the chosen clinical organization were central to this dissertation.

The research began with the real problem and need to understand referral communication as a mean to improve patient care. Despite previous efforts by researchers to explain referrals, the dynamics and interrelations of the variables that influence referrals and the elements that constitute a referral in healthcare, there is not a

common, contemporary, and accepted definition of what a referral is in the healthcare context. While in fact the research agenda we had initially proposed acknowledged the inexistence of a common and accepted definition of referrals, it was early in the process that I realized, guided by my mentors, that there was an even more urgent need to explore referrals first as an abstract concept by: 1) developing a conceptual definition of referrals, 2) developing a model of referrals, and 3) developing a research framework.

These points resulted in the first two of three manuscripts. The first manuscript entitled "Referrals in Healthcare: A Concept Analysis" addresses developing a definition and a model of referrals using a concept analysis method. The purpose of a concept analysis is to explicitly identify the defining attributes of a term. Walker and Avant's eight-step method of concept analysis was used to clarify and define referrals and develop a conceptual definition and a model of referrals. A referral is defined as a *healthcare process that results in the transfer of patient care from a referring provider to a secondary service or provider, and the transfer back when and if appropriate*. This is a standard definition that can be used by healthcare providers, other researchers, and healthcare administrators when talking about referrals. The definition is inclusive of all the defining attributes of a referral in healthcare. This definition includes the 12-referral defining attributes that include 3 basic agents and 9 associated events. The agents included in the definition of referrals are the patient, the referring provider and a secondary service or provider; the 9 referral related events include the interaction between a patient and the referring provider, the appropriate medical workup prior to the referral, the decision to refer, the communication between providers, the assessment of the merits of the referral, the transfer of patient care, the interaction between the patient

and the secondary service or provider, as well as the return transfer of patient care to the referring provider when and if appropriate. The derived standard conceptual definition was used to create a model of referrals in healthcare. The diagram explains the referral process. The model shows how the various agents interact and the dynamics and sequence of the events that need to occur for the referral to take place. The model also highlights some aspects that make up the complexity of the referral process. In particular the model emphasizes the role of context and how it can constraint or facilitate the referral process.

The second manuscript is a methods paper and is described in "A Mixed-Method Framework to Evaluate Referrals in Healthcare". Based on the derived model of referrals, and taking into consideration the central roles context and communication have in successful referrals I developed a mixed-method framework to address the complexity of studying and assessing referrals. The mixed-method framework is an iterative process and it consists of a sequence of steps that includes both qualitative and quantitative methods to study referrals. The mixed-method framework to evaluate referrals includes three main tasks: 1) An analysis of the referral context in which referrals occur, 2) A characterization of the written referral communication, and 3) The development of a multi-element referral assessment tool. At each step the mixed-method framework to evaluate referrals allows us to clearly identify the referral information and communication flows, any potential indicators related to the referral process of successful referrals, the written referral communication elements that could be used as indicators of successful referrals, and any context-dependent constraint that should be taken into account in order to improve that particular referral process.

The analysis of the referral context is accomplished by conducting four types of analyses at the particular site where referrals occur. The four types of analysis to understand the referral context include an analysis of the agents involved in the referral process, an analysis of the functions agents carry out, an analysis of the tasks agents have to perform, and finally an analysis of the interactions agents have before, during and after a referral occurs. The written referral communication characterization involves collecting, analyzing and characterizing a sample of the written referral communication documents used by providers when referring at the selected site. The characterization process results in the identification of the various combination and uses of communication elements that could potentially be used as indicators of the success of a referral at that particular setting. The final step in the mixed-method framework to evaluate referrals is to develop a statistical construct to assess referrals. This hypothetical assessment tool I call "Referral Impact" is constructed as a latent variable model where all the identified indicators of successful referrals are statistically weighted and used a model. Ultimately, the mixed-method framework to evaluate referrals provides a systematic method to analyze and evaluate referrals. The framework serves as a common starting point for any comparative research agenda focusing on referrals.

The third and final paper for this dissertation reports the findings from a real-world study on referrals made by primary care providers to specialty services. This paper describes findings that are part of the larger qualitative-quantitative study where we used the mixed-method framework to evaluate referrals. The purpose of the particular study described in the manuscript was to develop and test a statistical model that could be used to predict whether a referral will be approved when reviewed by a specialty service. A

discriminative function was used as the core of the prediction model described in this paper. The model was constructed first using all 9 available variables related to the referrals, and the outcome of the review by the specialty service as the dependent variable to be predicted. Subsequent iterations of the model included the use of only the set of variables with the highest discriminative power; finally an iteration where the single variable with the highest discriminative power based on the size of the variable's correlation within the model was created and tested. All three iterations of the model resulted in high correct discrimination rates. This means that in practice models like this one can be used to assess referrals and help providers improve referrals. The target audience for this paper is those specifically interested in how to improve referrals at a practical level.

Together, the three papers represent the spectrum of this dissertation research for the study on referrals. This dissertation has resulted in a standard conceptual definition of referrals and a model of referrals that includes the 12 defining attributes of referrals. In addition a mixed-method framework to evaluate referrals was proposed, which consist of a systematic approach to the study of referrals. And finally a data driven model was developed to predict whether a referral would be approved when reviewed by a specialty service using available variables related to the particular referral process. These three manuscripts present the basis for studying and assessing referrals using a common framework that should allow an easier comparative research agenda to improve referrals taking into account the context where referrals occur.

Adol Esquivel, M.D., M.S.
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Manuscripts

Referrals in healthcare: A Concept Analysis

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Referrals in healthcare: A Concept Analysis

Abstract

Background and purpose: The concept of healthcare referral in the outpatient setting has no consistent, common or accepted definition in the literature. The lack of a clear definition is a barrier to improving the referral process and conducting comparative research. This paper outlines the process of the development of a conceptual definition and a model of outpatient referrals in healthcare.

Method: We conducted a concept analysis informed by an integrative review of the literature to clearly define referrals in healthcare.

Results: We identified 12 defining attributes of healthcare referrals in the outpatient setting. These 12 defining attributes include all the necessary steps to transfer the care of the patient from the referring provider to a secondary service or provider, and back to the referring provider's care when and if appropriate. We propose a conceptual definition and a model of referrals in healthcare based on the 12 defining attributes of referrals.

Conclusion: The resulting conceptual definition and model provide a framework to conduct research and improve the referral process.

Background and purpose

More than 270 million patients in the United States are directed to specialists by their primary care providers each year(1,2). Healthcare referrals in the outpatient setting are a common practice, are made to assure that patient's healthcare needs are met(3), and are a way of improving the quality of care. In general primary care providers refer

patients to other services or providers to obtain advice on diagnosis or management, to obtain a specialized procedure, or to obtain a second opinion(4).

Referrals are critical components of primary care that are susceptible to breakdowns. Breakdowns in the referral process can result in poor continuity of care, slow the diagnostic process(5), cause delays and repetition of diagnostic tests(6), contribute to polypharmacy(5), increase litigation risk, cause patient and provider dissatisfaction, and promote loss of confidence in providers. Referral breakdowns threaten the quality of care(7-10). These threats to the quality of care justify the need for a deeper understanding of referrals in order to improve patient's health and reduce costs.

Understanding and improving outpatient referrals in healthcare is a problem because there is not a current and accepted definition. Researchers have proposed the notion of three sets of variables influencing the way referrals occur. These sets of variables include variables related to the patient, to the care providers, and to the community(11). However, the dynamics of these variables and their interactions have not been explained. A referral has also been thought to have at least three events: 1) the referring provider communicating reasons for the referral and relevant patient information to the secondary service or provider, 2) the secondary service or provider completing the referral by communicating findings to the referring provider, and 3) the providers and the patient negotiating continuing care arrangements (12,13). This exchange of information helps providers better understand their patient and improve patient care(14). Despite these efforts to explain referrals, the dynamics and interrelations of the variables that influence referrals and the elements that constitute a referral have not been clearly defined. The lack of a clear definition and an accepted framework to study

outpatient referrals in healthcare is a barrier to improving the referral process and conducting comparative research.

A clear definition of referrals will provide the basis for an appropriate referral framework to study and improve the referral process. In this paper we outline the process of the development of a conceptual definition and a model of outpatient referrals in healthcare using a concept analysis informed by an integrative review of the literature.

Method

We used Walker and Avant's(15) 8-step method to guide our concept analysis of healthcare referrals. Walker and Avant's method is a streamlined version of Wilson's(16) and results in a less complex and more direct strategy to concept analysis. This method is specifically conceived to conduct concept analysis and it has been extensively used for this purpose with great success. The steps employed for the concept analysis of referrals in the healthcare context are shown in Table 1.

A) Select a concept.
B) Determine the aims or purposes of the analysis.
C) Identify all uses of the concept.
D) Determine the defining attributes.
E) Identify a model case.
F) Identify other cases.
G) Identify antecedents and consequences.
H) Define empirical referents.

Table 1. Steps for the concept analysis of referrals in healthcare

We conducted an integrative review of the literature related to healthcare referrals to support the concept analysis process. We searched MEDLINE using PubMed. We limited our search to human-health related articles published in English, and indexed in PubMed before May 1 2008. A preliminary search using both MeSH (Medical Subject Headings) terms and keywords resulted in sets of publications that did not focus solely in referrals. Furthermore, a preliminary review of the resulting literature suggested that the term "*consultation"* was closely related to the referral concept and commonly used in conjunction. Based on these preliminary findings, our final search strategy included the following terms limited to the title of the publication: referral process, consultation process, outpatient referral, outpatient consultation, specialty referral(s), and specialty consultation(s).We identified, retrieved and analyzed the full text of 139 publications out of which only 14 met the inclusion criteria of explicitly providing a formal definition or discussion of the concept of outpatient referrals in healthcare.

Results

A.Selection of the concept and purpose of the analysis

The need exists for a clear conceptual definition and description of the attributes of referrals in the healthcare context. The lack of a referral conceptual definition is the justification for choosing the concept of referrals as the main focus of this concept analysis. The purpose of this concept analysis is to clearly define the concept of referrals in healthcare. We will propose a conceptual model based on the definition of referrals. The resulting conceptual definition and model of healthcare referrals will provide a framework to study and improve the referral process.

B. Identifying the use of the concept of referrals in healthcare

The term referral has different meanings depending on the context in which it is utilized. For example, the American Heritage Dictionary of the English Language defines *"to refer"* as follows: "to direct to a source for help or information"; the noun *"referral"* is defined by the same source, as: "to call or direct attention to something" (17). When using the term referral, we need to identify the context and be specific about its use, both in research and in clinical practice. The Oxford English Dictionary provides a more healthcare oriented definition of the concept and defines referral as "the action of referring someone or something for review, especially the redirecting of a patient by a general practitioner to a specialist"(18).

The healthcare literature describes a referral as a process. However, the majority of studies does not explicitly define referrals, nor describe the context in which referrals are being studied. Our review of the literature suggests that a referral consists of a series of organized and interrelated events that must take place in order for the care of the patient to be permanently or temporarily transferred from one provider to another (11,19-28).

The way in which referrals occur varies depending on the context. However the basic participants and events remain constant. Researchers consistently describe three main participants with well defined roles: a patient, a referring provider, and a secondary service or provider. Generally the patient is in need of care and under the care of the referring provider. The referring provider is often described as a primary care provider (20). The secondary service or provider is usually a specialist who possesses knowledge, skills or equipment that may benefit the patient(27,26).

During their interaction between the patient and the referring provider they discuss the risks, benefits, and possible outcomes of the referral. This interaction between patient and referring provider will provide the merits to justify and support the referral. Ideally, the referring provider is expected to conduct a timely and thorough medical workup prior to referring(27). While the referring provider is responsible for the decision to refer, the wishes, needs, and consent of the patient influence the referral decision(20). The decision to refer is considered when the particular healthcare need is not within the referring provider's scope(24). The referring provider then communicates with the chosen secondary service or provider(20). The communication should include the reason for the referral and relevant patient information(26). This communication step is vital to the success of the referral(6) and provides a chance for the referring provider to specify when and if the care of the patient should be transferred back to him. An assessment of the merits of the referral is conducted by the secondary service or provider, or designee. The complexity of this assessment can range from a simple decision to accept and schedule an appointment, to a thorough clinical review of the case. Effective referral processes include a case review to evaluate the appropriateness and completeness of the referring provider's workup of the patient. Incomplete workups may result in the secondary service or provider deferring a decision to accept the patient until an appropriate workup is completed(27).

If the referral is deemed appropriate, the care of the patient is temporarily or permanently transferred from the referring provider to the secondary service or provider(28). The patient then interacts with the secondary service or provider in order to address his healthcare need. Just as the interaction between the referring provider and the

patient provided the merits for the referral, the interaction of the patient with the secondary service or provider will generate valuable information to support the continuation of care(20). The secondary service or provider communicates with the referring provider once the issue that originated the referral has been addressed. The secondary service or provider should provide the relevant clinical information about the care that was given to the patient and details about the future coordination of care if appropriate(20,21,24,26). Finally, based on the initial terms of the referral, the care of the patient can be transferred back to the referring provider for continuation of care(28).

C.The defining attributes of referrals in healthcare

Defining attributes are a set of characteristics that are associated with a concept and help to differentiate between similar concepts (15).

Agents

1. Patient
2. Referring provider
3. Secondary service or provider

Events

4. Interaction between the referring provider and the patient
5. Medical workup
6. Decision to refer
7. Communication between providers
8. Inspection or review of the merits of the referral
9. Temporary or permanent transfer of care of the patient from the referring to the secondary service or provider
10. Interaction between the secondary service or provider and the patient
11. Communication between providers
12. Temporary or permanent transfer of care from the secondary service or provider to the referring provider

Table 2. Twelve defining attributes of referrals in healthcare.

From our discussion of the use of the concept of referrals in healthcare we extracted the defining attributes. We classified each attribute as a participating agent or an event taking place in the referral. We defined an agent as people, objects or systems participating in the referral (29); we defined an event as any activity or decision involving agents. The resulting 12 defining attributes of referrals in healthcare identified from the literature are shown in Table 2.

D. Identify a model case of referrals in healthcare

The following model case highlights all the 12 defining attributes of the concept of referrals in healthcare:

Mrs. Smith is a 53 year old woman with a history of hypertension who for the past few years has been seen once a year for regular checkups by the primary care provider, Dr. Good, at a community clinic. Five months ago Mrs. Smith presented at Dr. Good's office complaining of dysuria (painful urination). After examining Mrs. Smith, Dr. Good found no other signs or symptoms. A urine test showed microhematuria (presence of red blood cells in the urine) and a urine culture was positive for bacterial infection. Dr. Good diagnosed Mrs. Smith with a urinary tract infection and prescribed antibiotics. A few weeks later, the urine culture was negative but Dr. Good found Mrs. Smith continued to have microhematuria although she no longer complained of having dysuria. An imaging study (CT urography) ordered by Dr. Good showed no obstructions of the urinary tract. After explaining to Mrs. Smith the importance of further investigating why she continued to have blood in her urine with no other symptoms, Dr. Good decided to refer Mrs. Smith to the specialist and as per his clinic's policy, wrote and sent via fax the referral information to the urologist at the local hospital (See Figure 1). Dr. Good requested that the urologist assumed future management of the patient within his area of expertise and that the urologist contacted him by phone after seeing the patient.

Mrs. Smith was instructed to call the specialist's office in three days to check on the status of her referral and make an appointment. When Mrs. Smith called the specialist to inquire about her referral she was told Dr. Johnson (the urologist) had reviewed the information sent by Dr. Good and that he would see her in two weeks. Mrs. Smith was seen by Dr. Johnson and upon evaluation she was diagnosed with bladder cancer (squamous cell carcinoma). At that time, Dr. Johnson talked on the phone with Dr. Good

before and after discussing the diagnosis and treatment options with Mrs. Smith. Currently Mrs. Smith is under the supervision of Dr. Johnson at the local hospital undergoing her cancer treatment and is scheduled to see Dr. Good in a couple of weeks for her regular checkup.

[redacted]

CONSULTATION/REFERRAL REQUEST FORM

To: Consultant
Name: Dr. Johnson
Address: [redacted]
Phone/fax: [redacted]

From: Primary physician
Name: Dr. Good
Address: [redacted]
Phone/fax: [redacted]

SECTION 1 – REQUESTED ACTION

Consultation
(Please send the patient back for follow-up and treatment.)

( ) Confirm diagnosis.
( ) Advise as to diagnosis.
( ) Suggest medication or treatment.

Referral
(Please provide primary physician with summaries of subsequent visits.)

( ) Assume management for this particular problem and return patient after conclusion of care.
(**X**) Assume future management of patient within your area of expertise.

SECTION 2 – PATIENT INFORMATION

Name: Mrs. Smith
Address: [redacted]
Phone: [redacted]
Date of birth: 01/25/1955
Tentative diagnosis: Asymptomatic persistent mcrohematuria

Pertinent history, physical and laboratory findings, and special financial considerations:

Mrs. Smith is a 53 years old woman with a history of hypertension who was treated with antibiotics for a UTI. Mrs. Smith presents persistent microhematuria after resolution of the UTI. CT urography showed no obstructions. Please investigate and manage.

(**X**) See additional information attached.
(**X**) Please call me when you have seen the patient.
( ) I would like to receive periodic status reports on this patient.
( ) Please send a through written report when the consultation is complete.

Signature: _____
Primary Physician

SECTION 3 – CONSULTANT'S FINDINGS

( ) I would like to receive periodic status reports on this patient.

Signature: _____
Primary Physician

Figure 1. Referral information sent by the referring provider

The referral information sent by the primary care provider to the specialist in the model case is shown in Figure 1. The defining attributes highlighted in the model case are:

- Agents:
    1. Mrs. Smith (patient)
    2. Dr. Good (referring provider)
    3. Dr. Johnson (secondary service or provider)
- Events:
    4. Five months ago Mrs. Smith presented at Dr. Good's office (interaction between the patient and the referring provider)
    5. Dr. Good examined Mrs. Smith, treated her for a urinary tract infection, ordered and ordered an imaging study to rule out obstruction of the urinary tract (medical workup)
    6. Dr. Good decided to refer Mrs. Smith after discussing the situation with her (Decision to refer)
    7. Dr. Good wrote and sent via faxed the referral information to the urologist (communication between providers)
    8. Dr. Johnson had reviewed the information (inspection or review of the merits of the referral)
    9. Mrs. Smith was seen by Dr. Johnson (temporary or permanent transfer of care of the patient from the referring to the secondary service or provider)
    10. Dr. Johnson evaluated Mrs. Smith (interaction between a patient and a secondary service or care provider to whom a patient can be referred)

11. Dr. Johnson talked on the phone with Dr. Good (communication between providers)
12. Mrs. Smith is scheduled to see Dr. Good for her regular checkup (temporary or permanent transfer of care of the patient from the secondary service or provider to the referring provider)

This referral of a patient by the primary care provider to the specialist depicted in the model case shows the twelve defining attributes of referrals in healthcare.

E. Identify other cases

Borderline case

A borderline case is an instance that contains most of the defining attributes of the concept being examined but not all of them(15). The concept of "consultation" represents a borderline case example in relation to referrals in healthcare. Healthcare professionals, and the literature, often misuse concepts when describing similar circumstances; this is the case with the concept of "consultation". Close analysis highlights the difference between a referral and a consultation. The following consultation case is an example of a borderline case in relation to referrals in healthcare:

During Mrs. Smiths' last visit to Dr. Good's office she complained that her current blood pressure medication was no longer effectively controlling her symptoms. Apart from reviewing current lab results, carefully examining Mrs. Smith, and making sure she was following his other recommendations, Dr. Good decided to consult with Dr. Heart, a cardiologist at the local hospital. Dr. Good called Dr. Heart's office and, as per

his assistant's request, he sent via fax Mrs. Smith's relevant medical history and specifically asked whether an adjustment of the current medication was a good idea or if he should refer Mrs. Smith for management. That same day Dr. Heart reviewed the information and called back Dr. Good suggesting some modifications to Mrs. Smith's current treatment could help. He also provided some advice on what to do if the symptoms persisted.

A consultation can occur almost in the same way a referral. However important differences exist and should be noted. For example, the agents and events that can be identified in the borderline case include:

- Agents:
    1. Mrs. Smith (patient)
    2. Dr. Good (referring provider)
    3. Dr. Heart (secondary service or provider)
- Events:
    4. Interaction between Dr. Good and Mrs. Smith (interaction between the patient and the referring provider)
    5. Review of current lab results and careful examination (medical workup)
    6. Dr. Good decided to consult Dr. Heart (decision to refer)
    7. Dr. Good sent via fax Mrs. Smith's relevant medical history (communication between providers)

8. Dr. Heart reviewed the information (inspection or review of the merits of the referral)
9. Dr. Heart called Dr. Good and discussed his recommendations (communication between providers)

It is clear that a consultation can include all but one of the defining attributes of a referral: the actual transfer of patient care. The main difference between consultation and referral is that a referral requires the transfer of patient care from one care provider to another. In a consultation the provider initiating the consultation remains responsible for the care of the patient at all times(21, 28). It is important to point out that although a consultation can include most of the defining attributes of the referral, it can also be as simple as a phone call without any intermediate steps involved. The literature often has failed to differentiate the meaning of these two concepts and has sometimes mistakenly used them as interchangeable terms(20).

Related case

A related case illustrates fundamental elements that are similar to those found in the model case but are found to be different when scrutinized(15). Emergency care differs greatly from both primary and specialty care in the nature, duration and flow of the care provided to the patient. An example of a time when a patient is treated at an emergency room illustrates a related case with relation to referrals in healthcare:

About two months ago Mrs. Smith presented to the emergency room after cutting her finger with a knife while cooking. She was examined and treated by the emergency

physician. Mrs. Smith's wound was cleaned and closed with five stitches, a tetanus shot was administered, and an analgesic was prescribed. The emergency care physician told Mrs. Smith that she needed to be seen by her primary care provider in ten days to have the wound checked and the stitches removed. A discharge summary was faxed to Mrs. Smith's doctor's office and a copy was handed to her. The discharge summary described the care she had received and the treatment plan.

At first sight we may find that the process described in the related case closely resembles that of a referral. The following analysis highlights the attributes found in the related case scenario:

- Agents:
    1. Mrs. Smith (patient)
    2. Emergency care physician (referring provider)
    3. A primary care doctor (secondary service or provider)
- Events
    4. Emergency care encounter (interaction between the patient and the referring provider)
    5. Mrs. Smith was examined and treated (medical workup)
    6. Mrs. Smith is told to see her primary care provider within ten days (decision to refer)
    7. A discharge summary was faxed to the primary care doctor (communication between providers)

8. Mrs. Smith is expected to continue her care with her primary care doctor (temporary or permanent transfer of care of the patient from a referring provider to a secondary service or provider)

Careful examination of the related case demonstrates that although similar to a referral, the emergency care encounter lacks some of the defining attributes of a referral. First, the interaction between the emergency care physician and the patient is by no means a regular interaction. Because of the nature of the emergency event the interaction is composed of a single encounter. This single and fortuitous interaction contrasts with the more planned and often repeated encounters that take place before a referral. Second, emergency care settings are not designed to provide continuous care and thus the decision to transfer the care of the patient to the primary care provider is not a decision but the default action in most organizations. Third, the emergency care provider does not request or expect to receive communication from the primary care provider after the patient has been seen. Fourth, the secondary care provider, in this case the primary care physician, does not review the discharge summary to assess its merits as occurs in a referral. Finally, the care of the patient will not be transferred back to the emergency care provider, at least not consciously, by the primary care physician at any time.

Contrary case

Contrary cases are examples of "not the concept"(15). Based on the identified referral's defining attributes, referrals are healthcare processes where at least two care providers and a patient interact and communicate, a decision to refer is made, a review of merits of the referral take place, and the care of the patient is transferred from one

provider to another. The absence of the referral's defining attributes represents the antonym of a referral. A contrary case of referrals based on this logic can be illustrated by events where care is given by a single care provider and where no transfer of care occurs. Traditional primary care encounters between a patient and a primary care provider are good examples of contrary cases of referrals. The following is a contrary case of referrals in healthcare:

Last week Mrs. Smith went to see Dr. Good for her regular checkup. During the encounter Dr. Good made sure Mrs. Smith was taking all her medications and that her blood pressure was under control. They discussed how Mrs. Smith had adjusted to the changes made to her blood pressure medications. Mrs. Smith told Dr. Good that her symptoms had disappeared and that she was feeling quite good. No changes were made to the treatment plan and a follow up appointment was schedule in four months.

The elements identified in this contrary case include:

- Agents:
    1. Mrs. Smith (patient)
    2. Dr. Good (referring provider)
- Events:
    3. Regular checkup (interaction between the patient and the referring provider)
    4. Dr. Good made sure Mrs. Smith was taking all her medications and that her blood pressure was under control (medical workup)

5. A follow up appointment was scheduled in four months

During a primary care encounter the patient is care solely by the primary care provider and no transfer of care is needed. This traditional primary care encounter case is in essence a contrary case of referrals.

Illegitimate case

Illegitimate cases give examples of the concept used out of context(15). Our goal is to define referrals in healthcare, thus the use of the concept of referral outside the healthcare context constitutes an illegitimate case for the purposes of our discussion. For example, when a customer has a satisfying experience buying merchandise from a particular business, this customer will most likely refer his or her friends to that business in particular. This action of directing potential new customers to a business by a satisfied client is known as a referral in a general context. A discussion about a referral between two buyers in the context of referring new business to the local hardware store will have a different meaning than a discussion of a referral between a healthcare provider and a patient. The difference in meaning is attributable to the context in which the concept is being utilized. Communication between agents can suffer without clarification of the context in which the concept is being used.

F. Antecedents and consequences of referrals in healthcare

Referrals are one path in the continuum of patient care in a healthcare system. As part of the larger healthcare context, referrals have events that precede and succeed them. Figure 2 illustrates the generic antecedents and consequences of referrals emphasizing the

transfer of care from the non-referral care to the referral care process and back when and if appropriate.

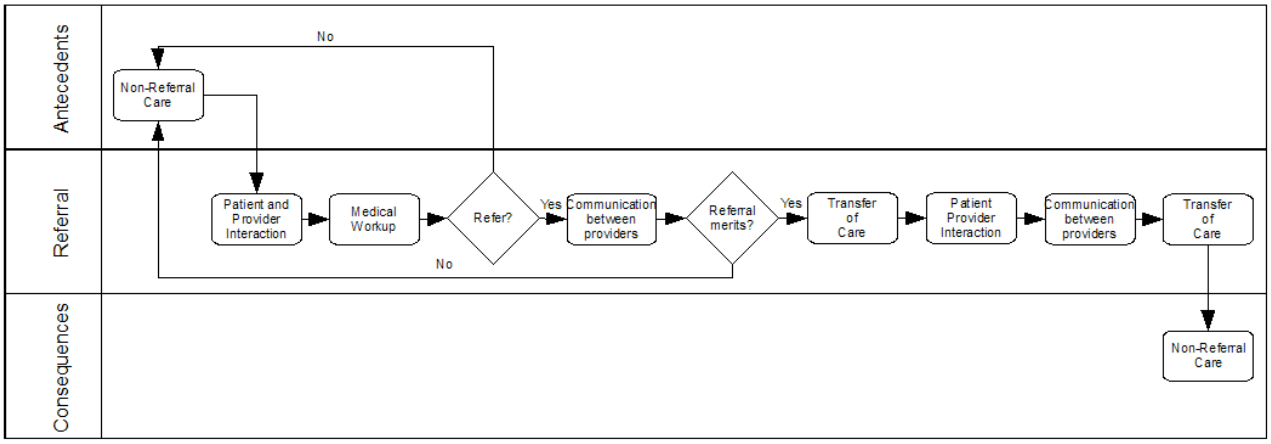

Figure 2. Antecedents and consequences to the Referral Process.

Antecedents of referrals include:

1. The non-referral care process
2. The consideration to refer the patient

The non-referral care antecedent highlights that a prerequisite of referrals is an interaction with a care provider as part of a non-referral care process. Traditionally this non-referral environment is a primary care setting. Under the supervision of a primary care provider, the patient may be considering for a referral to a secondary care provider. This consideration to refer is the second antecedent preceding the referral process.

Depending on the terms of the referral, the patient can remain under the care of the secondary service or provider. If, however, the health need has been addressed or the

terms of the referral specified so, the consequence of the referral is the transfer of patient care back to the referring provider and into the non-referral care process.

G. Identifying empirical referents of referrals in healthcare

Empirical referents are measures that support the existence of the concept. We can find measures of some aspect of referrals described in the literature. These measures consist of both quantitative and qualitative methods and include: referring and referred provider satisfaction(30-36), inclusion of desired information elements in the referral communication(6, 30, 33, 34, 36-39), appropriateness of the referral (32, 33, 40), communication turn-around time(6, 32, 33, 36, 40), referral communication style and structure(36), medium of communication(6, 26), and perceived overall quality of the referral(33, 36). These empirical referents found in the literature are difficult to organize, use and generalize because of the lack of a common framework. Nevertheless these empirical referents help support the instantiation of the concept and the 12 defining attributes of referrals in healthcare.

H. A Derived definition and model of referrals in healthcare

In summary *a referral is a healthcare process that results in the transfer of patient care from a referring provider to a secondary service or provider, and the transfer back when and if appropriate. A referral includes the interaction between a patient and the referring provider, the appropriate medical workup prior to the referral, the decision to refer, the communication between providers, the assessment of the merits of the referral, the transfer of patient care, the interaction between the patient and the secondary service or provider, as well as the return transfer of patient care to the*

referring provider when and if appropriate. This definition is inclusive of the 12 identified defining attributes of healthcare referrals. We use the derived conceptual definition of referrals to create the referral conceptual model shown in Figure 3.

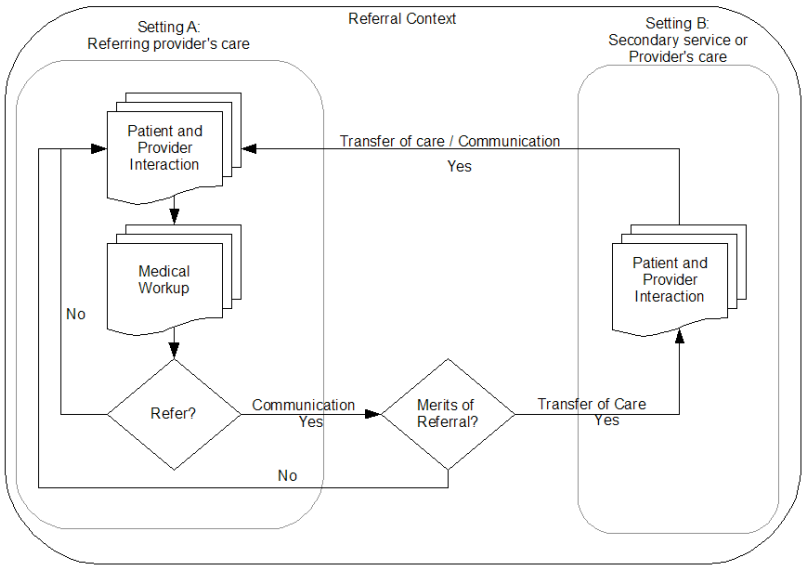

Figure 3. Referral conceptual model.

Our referral model is based on the 12 defining attributes of referrals in healthcare. The referral model presents the 3 agents and the 9 events in their ideal sequence with relation to their different settings and within a greater referral context. By constraining each agent inside a particular setting, our model implies that restrictions apply and limited resources are available to the agents during a referral. Each provider is constrained by their particular organizational context and also, to an extent, by the context of the referral itself. The model highlights the implicit complexity of the referral process by illustrating the physical separation between the setting of the referring provider and the secondary service or provider, and by placing them inside a contextual

referral environment. Our referral model also implies that the referral process is based on communication and, as with other communication processes, the norms and values imposed by the context restrict how it occurs (41). For example, an important aspect to consider with regard to the referral context is time. The time in which each step in the referral process must occur, or should occur, is dictated by the context. One would expect timely occurrence of referral events when dealing with a patient in urgent need for particular care. Furthermore, the increasing use of information technologies to support the referral communication, the selection of medium of referral communication, and the variety of healthcare settings increase the complexity of the referral process(41,42).

Discussion and Conclusion

Based on a concept analysis informed by an integrative review of the literature we identified 12 defining attributes of referrals in healthcare. Using the 12 defining attributes of referrals in healthcare we derived a conceptual definition and a model. The conceptual definition and the model of referrals in healthcare provide a clear framework to understand and improve the referral process.

Some important implications emerge from this concept analysis. We recognize that the need remains to test and validate the proposed conceptual definition and model as a framework to design comparative research about referrals. We believe that the framework provides enough structure to organize and interpret previous referral literature. The reorganization of existing referral literature under this framework would provide a more applicable and robust body of knowledge to improve the referral process. Each of the 12 defining attributes of referrals in healthcare should be a focus of interest

and study. Understanding individual attributes is essential if the referral process is to be improved.

The proposed conceptual definition and model of referrals in healthcare are general enough that we believe can explain more complex processes in healthcare. For example, we can use a series of instantiations of the model to explain the care of patients in a particular healthcare system. In this example, multiple providers participate in the care of multiple patients and the care of the patient is transferred multiple times in an effort to provide the best possible care. We can use the referral model to illustrate the co-management of patients by means of multiple referrals and the communication between providers. This approach takes into account the agents, the events, the settings, and the context that influence the healthcare system in question.

The most important implication of our proposed conceptual referral definition and model is the identification of the 12 defining attributes, their sequence, and constraints within settings, and to an extent within a larger referral context. The different referral settings and context are what shape and dictate how referrals occur and their outcomes. The proposed referral conceptual definition and model based on the 12-referral defining attributes provide the necessary framework from which to study and improve the referral process.

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A Mixed-Method Framework to Evaluate Referrals in Healthcare

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A Mixed-Method Framework to Evaluate Referrals in Healthcare

Abstract

More than 270 million visits to primary care providers in the United States are referred to specialists each year. This constitutes one third of the total visits to primary care providers every year. A mixed-method approach including qualitative and quantitative methods is proposed as an evaluation framework to study referrals in healthcare. The mixed-method framework consists of three independent sequential phases: 1) Phase one includes a series of analysis that provide a deep understanding of the particular referral context; 2) The second phase provides an objective way of characterizing the written referral communication; and 3) A hypothetical statistical construct, "Referral Impact" is proposed to assess referrals using aggregated data from multiple events. The main objective of this work is to provide the operational steps to a comprehensive framework of understanding and evaluating referrals in healthcare.

Introduction

An outpatient referral in healthcare is defined as the process that results in the transfer of patient care from a referring provider to a secondary service or provider, and the return of patient care to the referring provider when and if appropriate. This definition of referrals in healthcare includes the interaction between the patient and the referring provider, the necessary and appropriate medical workup prior to the referral, the decision to refer, the communication between providers, the assessment of the merits of the referral, the transfer of patient care, the interaction between the patient and the secondary

service or provider, and the return transfer of patient care to the referring provider when and if appropriate(1).

More than 270 million visits to primary care providers in the United States are referred to specialists each year. This constitutes one third of the total visits to primary care providers every year(2, 3). Referrals in the outpatient setting, are critical components of primary care and are susceptible to breakdowns. Breakdowns in the referral process can result in poor continuity of care, slow the diagnostic process(4), cause delays and repetition of diagnostic tests(5), contribute to polypharmacy(4), increase litigation risks, cause patient and provider dissatisfaction, and promote loss of confidence in providers. Referral breakdowns threaten the quality of care(6-9).

To identify potential causes of referral breakdowns researchers have studied isolated elements of the referral process. The complexity of the referral communication process has provided researchers with multiple assessable end-points. Such measurable end-points have been considered and used as indicators of the overall impact of referrals in healthcare. Indicators of the referral process as reported in the literature include: providers' satisfaction (10-16), inclusion of desired information in the referral document(5, 10, 13, 14, 16-19), referral appropriateness (12-14), communication turnaround times(5, 12, 16), referral document style and structure(16), medium of communication(5, 20), and perceived overall quality of the referral(13, 16). These indicators when used as isolated measures failed to provide a comprehensive approach to the evaluation of referrals in healthcare. New and more effective evaluation methods of referrals in healthcare are yet to be explored. We propose the use of a mixed-method approach to evaluate referrals in healthcare focusing on the context in which referrals

occur, the actual written communication between providers and a multi-element assessment.

The Conceptual Model of Referrals in Healthcare

The conceptual model of referrals in healthcare shown in Figure 1 is the starting point of the discussion. The model is based on a definition of referrals in healthcare that takes into account the 12 defining attributes of the referral process(1). The conceptual model of referrals in healthcare provides a framework to develop methods of analysis of the referral process. We intend to use the conceptual model of referrals in healthcare to develop such methods in order to understand and improve the referral process in particular settings.

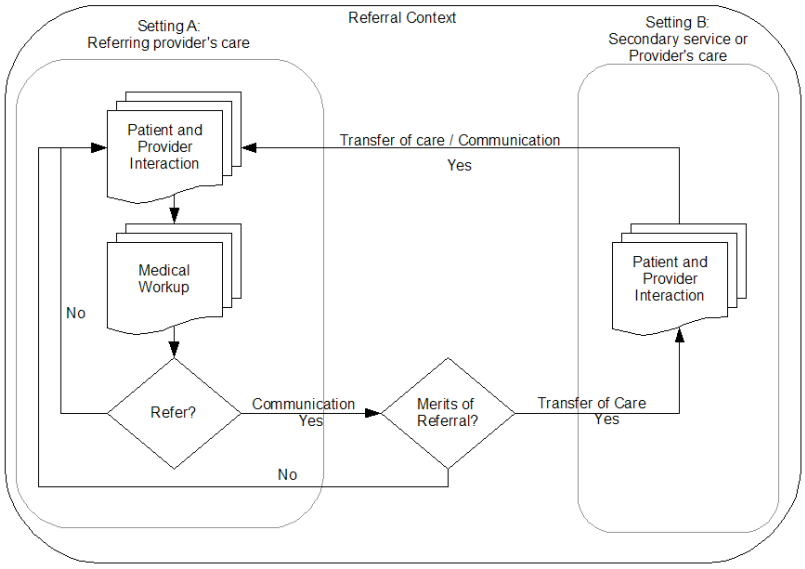

Figure 1. Referral conceptual model presenting the 3 agents and the 9 events that constitute a basic referral process.

To design effective ways to analyze and evaluate referrals we will discuss three main components illustrated in the conceptual model of referrals in healthcare: 1) Referral context, 2) Referral communication, and 3) Measurable endpoints of the referral

process. The first component of the conceptual model of referrals in healthcare is the inherent complexity of the referral process highlighted by the central role of the context in which a referral occurs. The various participants, settings, and steps depicted in the model are heavily influenced by the norms, values and constraints imposed by the context. For example, in a particular context an organization may have strict norms as to which specialists should be contacted when patients are to be referred. In such a case, the specific context not only will dictate and limit the resources available to the referring provider but may also dictate how the referring provider proceeds to communicate and transfer the care of the patient to the specialist. Other context's constraints include third party payers, referring guidelines, service agreements among providers, reimbursement plans, network rules, and state or federal regulations. Referral processes are highly dependent on context and this factor should be a serious consideration in any plan to evaluate referrals in healthcare.

The second key component of successful referrals suggested by the conceptual model of referrals in healthcare is the communication between participants. The basis of a successful referral includes the communication at the time when the referring provider initiates the referral and the communication when and if the care of the patient is transferred back to the referring provider. As mentioned earlier breakdowns in referral communication often occur; more importantly these breakdowns in referral communication threaten the quality of patient care (6-9, 21). The choice of how referral communication occurs has major implications in the outcome of the communication. The most common medium chosen to communicate referrals is a written referral letter or document (4-6, 8, 21-24). Referral documents can be transmitted using a variety of

technologies (i.e., e-mail, fax, phone, electronic medical records, face-to-face, etc.) How referral communication occurs should also be considered by any evaluation of referrals in healthcare.

Finally, the third major component of the conceptual model of referrals in healthcare is the large number of measurable end points along the path of the referral process that can be used as indicators of the effectiveness/success of the referral. As discussed earlier, there is not a single indicator that effectively mirrors the appropriateness or success of referrals in healthcare. Instead researchers have looked into a variety of isolated indicators as indicated in the published literature (i.e. turnaround times, appropriateness of the referral, provider's satisfaction, etc.). These isolated indicators of referrals vary based on the particular context in which referrals occur. The referral context dictates whether or not certain indicators are present, or if they can be implemented and measured. There is potential thus, if we understand the referral context, to construct multi-element indicators to evaluate referrals in healthcare based on the specific contextual understanding of the referral environment.

Although existing referral literature has addressed in various ways each of these aspects identified in the conceptual model of referrals in healthcare, a comprehensive approach that takes into account their interaction has not been formulated. Commonly used referral evaluation methods rely on quantitative analysis of various indicators. Very few studies have included qualitative methods to analyze and evaluate referrals (10, 17, 22, 25, 26). Both quantitative and qualitative based studies have strengths and can provide insight to the referral process. Robust evaluation frameworks that include a mixture of both qualitative and quantitative methods to assess referrals in healthcare have

not been proposed or tested. A qualitative perspective applied, for example, to the study of the referral context can aid in the identification of the norms, values and restrictions that affect the referral process. Field observations, referral document retrieval and analysis, as well as formal and informal interviewing of the referral agents can potentially render a clearer picture of the context in which referrals occur. Furthermore a qualitative approach can inform a quantitative analysis of the referral indicators and thus a mixed-method approach can provide a richer and deeper understanding of the referral process in a particular context. In the next section we will describe the proposed mixed-method framework to evaluate referrals in healthcare.

Mixed-Method Framework to Evaluate Referrals in Healthcare

Figure 2 illustrates the proposed evaluation framework of referrals in healthcare. The framework consists of three interdependent sequential phases. The phases are interdependent in the sense that each builds on the results that emerged from previous phases. In general terms, we propose an evaluation framework to understand and evaluate referrals based on the conceptual model of referrals in healthcare. Specifically, our proposed referral evaluation framework focuses on understanding the context in which referrals occur, characterizing the written communication between providers and developing a multi-element assessment. Our main goal is to provide the operational steps to a comprehensive method of understanding and evaluating referrals in healthcare.

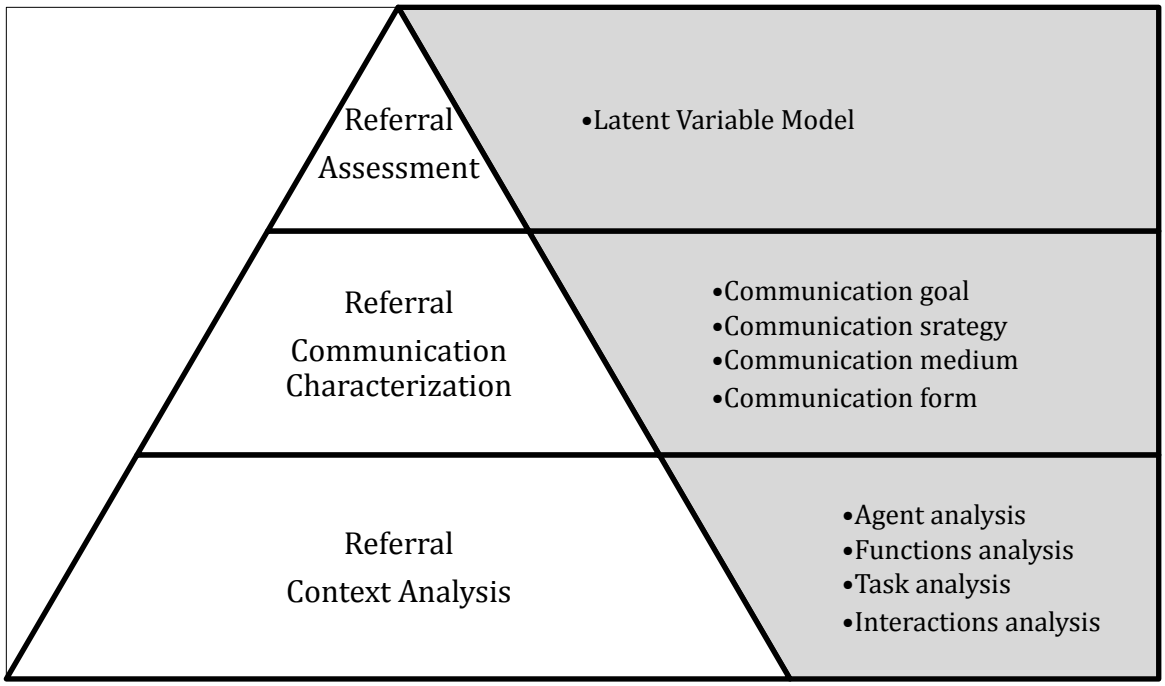

Figure 2. Mixed-Methods Evaluation Framework of Referrals in Healthcare

In the following sections we will discuss the operational steps that comprise the referral evaluation framework.

A.Referral Context Analysis

Referrals in healthcare are highly context-dependent processes that vary across settings. To appropriately evaluate and improve these context-dependent processes we must first understand the environment in which referrals occur. The first phase in the evaluation framework of referrals in healthcare addresses this need to understand the referral context. The referral context comprises formal and informal elements that surround the agents (humans, objects, and systems) that participate in the referral process and events that constitute a referral in healthcare. As mentioned earlier, some examples of formal elements accounted for in the referral context include third party payers, referring guidelines, service agreements, reimbursement plans, network rules, and state or

federal regulations among others. Some informal elements that often add complexity to the referral context include agent's attitudes, some aspects of the culture within particular organizations, values and norms, relationships, preferences, existing workflows, hidden agendas, etc. Understanding the referral context implies describing the environment, its resources and its constraints. It includes analyzing the agents that participate in the referral process, their functions, their tasks and their interactions.

In order to conduct a comprehensive context analysis we draw from proven theories and methods that have been successfully used in the analysis of clinical contexts as well as other complex communication environments (27-34). Four types of analyses provide the operational steps to study and understand the referral context:

a) Agent analysis. Coiera et al. (27) have proposed the use of agent analysis as the initial step in their framework to explain the quality of a subject's experience in a particular domain through their interactions. In the case of the referral context analysis the agent analysis will provide information to the functions, tasks and interactions analyses. An agent analysis should focus on identifying those agents participating in the referral process. Starting with the three basic agents suggested by the conceptual model of referrals in healthcare: a) patient, b) primary care provider and, b) secondary service or provider. However the agent analysis should not be limited to these three entities; the analysis should be expanded to agents that participate directly and indirectly in the referral process, including: nurses, administrative personnel, information systems, referral documents, referral guidelines, etc. The agent analysis should provide contextual information regarding the various entities related to the referral process. Basic

important agent characteristics to identify during the agent analysis include: demographics and agent's background (education, job description), professional role in the process, sequence of participation, and importance relative to the success of the referral. Finally the complete profiles of all agents should include, when relevant, skills, knowledge level, knowledge overlapping, and communication channels available to them.

b) Functions analysis. Based on the theory of Distributed Cognition, Zhang et al. (35) suggested a functional analysis as part of their method for designing human-centered distributed information systems. The end result of applying this framework is the content for a system implementation. In their functional analysis, Zhang et al. proposed analyzing top-level interrelations and constraints of agents in a particular domain. When analyzing a knowledge based domain such as referrals in healthcare, the functional analysis helps build detailed domain knowledge. In other words, conducting a functional analysis will help gain a deeper understanding of the referral context by identifying the expected functions of each agent and the interrelationships of these functions.

c) Task analysis (35). Task analysis is more concrete than functional analysis because it involves specific task structures and procedures. Task analysis is a critical component in cognitive systems engineering and usability engineering. It consist of identifying functions, task procedures, input and output formats, constraints, communication needs, organization structures, information categories, and task information flow. When conducting a referral context analysis a task analysis should identify referral protocols, guidelines, types of

referrals, and any other relevant organizational and/or cultural structure related to the referral process.

d) Interactions analysis (27). As suggested by Coiera et al., an interaction space can be built by modeling the most important interactions among agents. To construct the interaction space, one starts with a general description of an interaction between two agents. An agent has a number of functions and tasks that need to be carried out, and a pool of resources available to accomplish those functions and tasks. An interaction occurs between two agents when one agent creates and then communicates a message to another, to accomplish a particular task within a specified function. The interactions analysis step is an integration of the agents, functions and tasks analyses and should result in a deep understanding of the particular referral context.

A variety of qualitative methods can be used to study and analyze the referral context and thus to conduct the four proposed analyses. These qualitative methods include field observations, informal and semi-structured interviews, and document retrieval and analysis of the particular referral enrvironment. The end result of a referral context analysis using qualitative methods should include a rich and detailed understanding of the referral process including who participates (agents), what they are expected to do (functions and tasks), and how they interact in order to attain their objective: to conduct a referral. Also, this referral context analysis should clearly identify what constitutes the referral communication and if existing or potential indicators of referral success can be collected and/or implemented to assess the referral process. A key deliverable that should emerge from the referral context analysis is a clearly identified

and delimited referral communication process. The clear understanding about the particular referral process gained during the referral context analysis will inform the referral communication characterization phase of the mixed-method framework to evaluate referrals in healthcare.

B.Referral Communication Characterization

The second phase in the framework to evaluate referrals in healthcare requires us to collect, analyze and characterize a sample of the written referral communication documents at the particular referral environment. The characterization process results in the identification of the various combinations and uses of communication elements by providers in their written communication. The Cognitive-Affective Framework of Organizational Communication proposed by Te'eni et al. provides a practical approach to characterizing and analyzing written communication (36). This framework has been used by researchers to design and interpret communication processes in several organizational domains other than healthcare(37-40). The core of the communication process as stated by the Cognitive-Affective Framework of Organizational Communication is that communicators chose combinations of goals, strategies, mediums, and message forms in order to communicate effectively. The referral communication characterization phase systematically identifies the combinations of communication goal, strategy, medium, and message form used by both each provider and collectively as a group. Coding the written referral communication results in a structured set of data, which can then be analyzed using quantitative methods. The coding and measures of the written referral communication are based on classifications and counts of elements of actual communication elements.

The coding of the written referral communication begins with several operational definitions of what exactly constitutes the medium, message, communication goal and strategies. Keep in mind that as stated earlier, a written document or referral letter is the most common medium chose to communicate referrals (4-6, 8, 21-24). The medium is simply one of the following types: a typed referral letter, a hand written referral letter, or any other type of printed or computer-generated referral request identified and available in the particular referral context. The exact medium will be identified, as mentioned, during the referral context analysis. Ultimately there must be a referral document that can be coded. Each referral document is considered a communication package with a single message with an identifiable communication goal (41). The message's communication goal, based on the Cognitive-Affective Framework of Organizational Communication (36) can be one of the following:

a) *To instruct action:* commanding specific action involves communication to the receiver to initiate a specific action, usually in the form of an instruction. This category includes setting work procedures and rules. The emphasis is on general guidelines or ongoing directives.

b) *To manage interdependent action:* managing a collective and interdependent action. Collective action begins after a collective goal has been agreed upon. Managing collective action may be similar to instructing action but must include more than one agent in making the decision or implementing it so that there is also a need for managing the group of agents.

c) *To manage relationships or Communicate action:* Providing and obtaining information for future action. Providing information is about knowledge dissemination, teaching, training, all for something that is usually not clearly directed to an immediate action but it is up to the receiver to apply it to future actions or some current issue that requires the receiver's association. Seeking information for future action.

d) *To influence:* As opposed to commanding actions, in influencing or persuasion there is usually an obvious element of judgment on behalf of the receiver whether to oblige or not. Note further that if there is a dilemma between influencing and another category, choose influencing.

Once the communication goal has been identified, the coding process continues by reading the entire message one sentence at a time and coding each sentence based on the identified communication goal. These elements are the building blocks of the message, that is, the action to be taken and the reason for the action. The elements will be classified into categories depending on the goal of the message to which they belong.

In a communication goal to instruct action or to manage interdependent action, the categories in which to classify each sentence are:

a) Action detail (the core)

b) Reason for action

c) Explanation of "how" details (sub-actions)

d) Related information (other background)

In a goal to manage relationships or to communicate action, the categories in which to classify each sentence are:

a) Topic of information (the core)
b) Relevance and importance
c) Detailed informational
d) Related informational

In a goal to influence, the categories in which to classify each sentence are:

a) Proposition or opinion details (the core)
b) Motivation for propositions
c) Proposition pros and consideration
d) Related information

Count and register the number of sentences and the number of words in each element category across the message in the package.

The next step in the referral communication characterization process is to code the message's communication strategies according to the following operational definitions (41)

a. Contextualization: it is defined as the proportion of words in the message devoted to non-action elements.
b. Affectivity: defined as the proportion of social words in the middle of the message. Some examples of social words include greetings, salutations, and also words like please and thank you.

c. Perspective taking: Considering the entire message put 1 if there is no consideration of the receiver's perspective, background, and possible perceptions of the message. Put 2 if there is some thought of the receiver's possible reactions, perceptions, and misperceptions of the message, background, language, role, etc.

Finally, the referral communication characterization process requires the coding of the message's form. The message's form is coded by identifying the degree of the message organization. The degree of message organization is a multidimensional construct that characterizes the message as being more or less structured for improved understanding (20, 42). The components that support understanding are order, organized and accessible layers of context, and familiarity to ease inferences and memorization. For each of the following four dimensions of organization indicate 0 (none), 1 (little or moderate), or 2 (high) (41):

d. An obvious set of ordered elements clearly distinguished (e.g. paragraphs with an opening that indicates the theme or sections with subtitles or numbering). Put 2 only if numbering or subtitles of paragraphs are present rather than just a list of items. This requires a complex message to warrant such organization.

e. A clear allocation of tasks between senders and receivers. Put 1 if there is one simple instance of allocation (e.g., "I am letting you know"). Put 2 if there is more elaborate division (e.g. "you will do x and I will do y").

f. A clear access to different levels of specificity (e.g. explanations as footnotes, references to documents that provider more details or a more complete rationale). Put 1 if there are references to documents that explain or provide related information. Put 2 if there are details or rationale in a different format (e.g. footnotes, indented paragraphs). In electronic media put 2 if there are hyperlinks to more detailed information.

g. A standard format with customary greetings, subject, references and ending, or a given template, including professional standards of writing such as appropriate for legal documents, letters, etc. Put 1, if standard opening, ending and parameters such as subject, reference, and contact information are present. Put 2, if professional formats such as a standard appointment letter, legal agreement, tables, and graphs are present.

In summary, the referral communication characterization requires collecting and analyzing a random sample of written referral documents. Informed by the results of the referral context analysis of what exactly is a referral document at the specific setting, the referral communication characterization involves coding and categorizing the communication elements found in the written referrals. When finalized, the referral communication characterization deliverables include the identification of the different combinations of communication elements (goal, strategy, medium and form) used by each provider, as well as the frequency of each combination within the group after each referral has been aggregated.

C.Referral Assessment

The referral assessment phase of the framework to evaluate referrals in healthcare constitutes a process of integration. Many elements that were identified during both, the referral context analysis and the referral communication characterization phases can be used to construct a multi-element referral assessment tool. Such proposed assessment tool should not only take into account traditional indicators reported in the literature but also make use of the communication elements characterized in the second phase of this framework. Being that communication is at the core of the evaluation framework of referrals in healthcare, this last phase focuses on building an assessment tool that allows us to assess the impact of referral communication in a referral process. We argue that the use of referral indicators and communication elements as part of the assessment can yield a better way to predict or explain the outcome of referrals considering the specific referral context.

In order to create an assessment tool based on a series of meaningful observable findings, such as the referral indicators and the characterized referral communication elements, we propose the construction of a Latent Variable Model (LVM) (43). LVM modeling is a useful method for specifying, estimating, and testing hypothesized interrelationships among a set of meaningful variables (43). Interrelationships among observed indicators in the referral process can be explored using LVM. A LVM can be constructed assuming that the high associations between available observed indicators are explained by a latent variable. A latent variable is a variable that an investigator has not measured and, in fact, typically cannot measure (43). Latent variables are hypothetical constructs proposed for the purpose of understanding a research area; generally there

exists no operational method for directly measuring these constructs (43). A LVM explains the statistical properties of the measured indicators in terms of the hypothesized latent variable. The model determines goodness-of-fit of the model to sample data on the measured indicators; if the model does not acceptably fit the data, the proposed model is rejected as a possible candidate for the structure underlying the observed indicators. The model relies on the use of reasonable and theory-driven variables as inputs to the model; in other words there must be a true relationship between the constructs of the model and the latent variable (43).

In practical terms, the basic building block of a LVM is the regression equation (43). Such an equation specifies the hypothesized effects of certain variables (called predictors) on another variable (called criterion). In a LVM the criterion represents the latent variable or the theoretical construct proposed by the researcher that is defined in terms of the predictors. To illustrate, consider the equation $Y = b_1X_1 + b_2X_2 + b_3X_3 + e$. The parameters b_1, b_2, and b_3 represent the regression weights to be used in optimally explaining Y from the Xs, and e represents an error of prediction. In this basic equation there are four predictor variables $X_1 – X_3$, and e, and Y is the criterion variable. A regression equation in the context of a latent variable model is called a structural equation, and the parameters, structural parameters. Structural parameters represent relatively invariant parameters of a causal process, and are considered to have more theoretical meaning than ordinary predictive regression weights. Implicit in the equation are parameters associated with the variances of the predictor variables as well as their covariances.

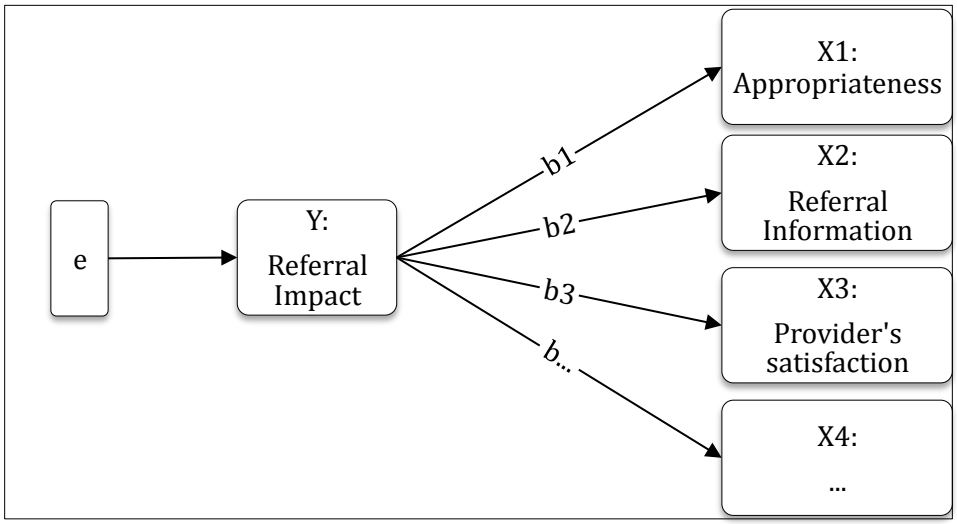

Figure 3. Referral Impact construct representation.

For the purposes of building the desired multi-element referral assessment tool we propose to create and test a LVM with a hypothetical construct called "Referral Impact". The "Referral Impact" construct is the latent variable in our LVM. The "Referral Impact" variable will be used to assess the theoretical influence of the multiple communication elements and indicators. Figure 3 presents a simplified representation of the "Referral Impact" construct in the LVM. The diagram depicts some of the observed indicators with some theoretical influence on the "Referral Impact". The aim of the construct is to determine the strength of each indicator's influence indicated by the arrows. Also the "Referral Impact" construct will determine the covariances or correlations and variances among the indicators. The LVM using the "Referral Impact" variable will be iteratively used to determine the goodness-of-fit of the model to the sample data testing all available observed indicators.

The end result of constructing and iteratively testing the "Referral Impact" model is a single metric composed of multiple theoretically sound elements associated to the particular referral process being studied. The "Referral Impact" can be used to

individually assess referrals or to aggregate the result of multiple referrals in order to better understand a particular referral process.

The proposed mixed-method framework to evaluate referrals in healthcare constitutes an operational and systematic approach to analyzing referral processes regardless of the clinical setting and the context in which referrals occur. The three sequential phases, referral context analysis, referral communication characterization, and the referral assessment phase, we argue provide the necessary understanding and consideration to the particularities of the context that influence the referral process. Furthermore the mixed-method framework to evaluate referrals in healthcare provides a common set of operational steps that permit comparisons across different referral settings.

Conclusion

In summary, the mixed-method framework to evaluate referrals in healthcare consists of three phases. Phase one includes a series of analyses that provide a deep understanding of the particular referral context. The operational steps to conduct the referral context analysis rely primarily on qualitative methods. The nature of qualitative methods permits the discovery of unknown and unexpected aspects of referrals that may enhance or impede the process and that should be taken into account in any referral evaluation effort. The second phase of the framework to evaluate referrals in healthcare provides an objective way of characterizing referral communication. The analysis of the written referral communication, at the core of the referral process, lets us determine and categorize the various ways in which referral communication occurs. The referral communication elements identified during this second phase of the framework to

evaluate referrals in healthcare are then used in the third and last phase of the framework to construct a multi-element referral assessment tool. The use of a hypothetical construct to assess referrals, the "Referral Impact" variable, which relies on the various indicators and communication elements that emerged from the evaluation of the referral process reflects, predicts and assesses referrals in a more comprehensive manner than isolated indicators used in the past. The "Referral Impact" construct can then be used to assess and improve individual referrals or to analyze aggregated data from multiple referrals. Ultimately, the mixed-method framework to evaluate referrals in healthcare provides a systematic method to analyze and evaluate referrals. The mixed-method framework to evaluate referrals in healthcare can provide the necessary common framework to conduct referral research, analysis, evaluation and comparison across different settings.

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When your words count:

A Discriminative Model to Predict Referral's Approval

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When your words count: A discriminative model to predict referrals' approval

Abstract

Objective: To develop and test a model which correctly predicts whether a referral will be approved when reviewed by a specialty service based on 9 discriminating variables.

Design: Retrospective cross-sectional study.

Setting: Large public county hospital system in a southern United States' city.

Participants: Written documents and associated data from 500 random referrals made by primary care providers to medical specialty services during the course of one month.

Main outcome measures: The resulting correct prediction rates obtained by the model.

Results: The model correctly predicted 78.6% of approved referrals using all 9 discriminating variables; the model correctly predicted 75.3% of approved referrals using all variables in a stepwise manner; the model correctly predicted 74.7% of approved referrals using only the referral total word count as a single discriminating variable.

Conclusions: The three iterations of the model correctly predicted approximately 75% of the approved referrals in the validation set. A correct prediction of whether or not a referral will be approved can be made in at least 3 out of 4 times.

Introduction

An outpatient referral in healthcare can be defined as the process that results in the transfer of patient care from a referring provider to a secondary service or provider, and the return of patient care to the referring provider when and if appropriate (1). More than 270 million visits to primary care providers in the United States are referred to

specialists each year. This constitutes one third of the total visits to primary care providers every year (2, 3). Referrals in the outpatient setting are critical components of primary care and are susceptible to breakdowns (4, 4-9). An effective referral process includes a review of each case to evaluate the appropriateness and completeness of the patients' workup and the merits of each referral. Incomplete workups may result in deferring a decision to approve the referral by the specialist, until an appropriate workup is completed (10). As part of a larger quantitative and qualitative study of referrals aimed at developing methods to assess written referrals and their outcomes, we developed and tested a model to help increase the approval of referrals at a large public county hospital system in a southern US city. The aim of the model is to statistically distinguish referrals that will be approved from those that will be denied when reviewed by the specialty service.

Methods

Five hundred random de-identified referrals written by primary care providers between October 1 and October 31, 2007 were collected. They represented approximately 1% of the total referrals for that period. Each referral included basic demographics, general referral information, comments by the primary care provider, reason for referral and the associated diagnoses. Additional variables related to the referral process of each referral were collected. A total of 9 potential discriminating variables and the outcome of the review of each referral by a specialty service were included in this study. See Table 1.

Table 1. Available Referral Discriminating Variables

Variable	Type	Value (s)
Referral review outcome	Nominal	Approved / Denied
Age	Continuous	
Gender	Nominal	Male / Female
Priority	Nominal	Regular / Urgent
Provider's comment word count* (WC-MDComment)	Continuous	
Reason for referral word count* (WC-Reason)	Continuous	
Referral total word count* (WC-Total)	Continuous	
Time elapsed from referral creation to referral review* (T-ReferralReview)	Continuous	In days
Time elapsed from referral review to decision* (T-ReviewDecision)	Continuous	In days
Time elapsed from referral creation to referral decision* (T-ReferralDecision)	Continuous	In days

*Variables with non-normal distributions

The sample was divided into two sets, a training set and a hold-out-set to validate the model. Two hundred of the 500 referrals were randomly selected for inclusion in the training set. The data for all 500 referrals was entered into the statistical software SPSS ® for Windows, Rel. 16.01. 2007. Chicago: SPSS Inc. Normal values for the variables with non-normal distributions were calculated in SPSS ® using the Rankit method. A discriminative function was created as the basis for the statistical model. Discriminative functions are created to predict group membership based on linear combinations of a set of predictor variables. All 9 available referral variables were used to calculate the discriminative function in the first iteration of the model. Subsequent iterations of the model were tested using a stepwise method introducing one variable at a time to identify and select the set of variables with the highest discriminating power. Finally the variable

with the highest discriminative power based on the size of the variable's correlation within the model was used as a single predictor in the model. For validation purposes the various iterations of the model were used to classify the remaining 300 referrals in the hold-out-set. We compared the correct discrimination rate of the iterations of the model.

Results

Table 2 shows a summary of the referral data used in this analysis.

Table 2. Referral data summary

N=500

			Training Set (n=200)		Validation set (n=300)	
			Denied	**Approved**	**Denied**	**Approved**
Review Outcome			144 (72%)	56 (28%)	212 (70.7%)	88 (29.3%)
			Male	**Female**	**Male**	**Female**
Gender			78(39%)	122 (61%)	107 (35.7%)	193 (64.3%)
			Regular	**Urgent**	**Regular**	**Urgent**
Priority			196 (98%)	4 (2%)	291 (97%)	9 (3%)
	Mean	**Min**	**Max**	**Mean**	**Min**	**Max**
Age	51.64	6	81	50.34	3	85
WC-MDComment	65.72	0	2196	70.60	0	2070
WC-Reason	48.98	1	295	59.37	2	435
WC-Total	111.90	1	2208	124.84	2	2205
T-ReferralReview	3.16	0	56	5.65	0	370
T-ReviewDecision	10.75	0	113	12.05	0	113
T-ReferralDecision	13.92	0	113	17.71	0	370

During the development of the model using the training set, the model correctly classified approved referrals in 76.4% of the cases using all 9 variables in a single step; when using all variables in a stepwise manner, the model correctly classified approved referrals 71.5% of the cases. The stepwise method identified the referral total word count and the time elapsed from the creation of the referral until the review by the specialty service as the two variables with the highest discriminative power. However, the referral

total word count was the variable with the highest discriminative power with an absolute correlation within the model of .704. Using the referral total word count as the single predictor, the model correctly identified approved referrals 71% of the time in the training set. When validating the model using the data from the referrals in the hold-out-set, the model correctly identified 78.6% of the approved referrals using all 9 variables, 75.3% in the stepwise iteration, and 74.7% using the referral total word count as the single predictor.

Table 3 shows the calculated discriminative coefficients for the variables used in the model in all three iterations. Table 4 shows a summary of the classification results comparing the results when using both the training and validation sets for the various iterations of the model.

Table 3. Canonical Discriminative Coefficients

	Model iteration 1: All 9 variables	Model iteration 2: Variables-Stepwise	Model iteration 3: Total word count
Gender	-.505		
Priority	.000		
Age	-.245		
WC-MDComment	.145		
WC-Reason	.703		
WC-Total	.217	1.027	1.096
T-ReferralReview	-.288	.616	
T-ReviewDecision	-1.398		
T-ReferralDecision	1.213		
Constant	.602	.114	.093

Discussion

All three iterations of the model yielded a correct discrimination rate of approximately 75% when used in the validation set. This means that in practice we could predict in at least 3 out of 4 times whether the referral will be approved when reviewed by the specialty services. The highest correct prediction rate was obtained when the model included all 9 discriminating variables available. For the particular environment

where the referrals used in this study were collected, a correct prediction rate of 78.6% yielded by the model using all 9 variables may prove to be useful in practice; however, the advantage of the second and third iterations of the model lies in the use of fewer variables that are easily measured in order to correctly classify each event. Evaluating referrals is difficult because of the great variability in the way referrals occur in different settings. Identifying common indicators that allow comparative and predictive studies is difficult. The use of simple and available indicators such as the number of words in the referral, in combination with indicators that are specific to the environment under study may be a convenient way to quickly assess whether or not a referral will be processed appropriately. The total word count probably reflects the amount of context the referring provider is including in the referral. A preliminary assessment of the referral communication word by word seems to indicate that the more meaningful clinical context is provided in the referral, the higher the chances the referral has to be approved upon review.

Statistical prediction models like the one described in this study can have practical clinical applications. For example, developers of information systems that are designed to support clinical communications could incorporate these types of models as part of their functionality in order to provide basic decision support to clinicians. A referring provider could be asked to provide more context for their particular case before the referral is submitted for review if it does not meet the threshold predicted by the model.

Table 4. Model Classification Results

Iteration 1: All variables in a single step [a,b]

			Predicted Group Membership		
		Review Outcome	Denied	Approved	Total
Training	Count	Denied	19	37	56
		Approved	11	133	144
	%	Denied	34.5	65.5	100.00
		Approved	7.6	92.4	100.00
Validation	Count	Denied	32	56	88
		Approved	9	203	212
	%	Denied	36.8	63.2	100.00
		Approved	4.2	95.8	100.00

a. 76.4% of training cases correctly classified
b. 78.6% of validation cases correctly classified

Iteration 2: All variables stepwise [c,d]

			Predicted Group Membership		
		Review Outcome	Denied	Approved	Total
Training	Count	Denied	9	47	56
		Approved	10	134	144
	%	Denied	16.1	83.9	100.00
		Approved	6.9	93.1	100.00
Validation	Count	Denied	22	66	88
		Approved	8	204	212
	%	Denied	25.0	75.0	100.00
		Approved	3.8	96.2	100.00

c. 71.5% of training cases correctly classified
d. 75.3% of validation cases correctly classified

Iteration 3: Using only Referral Total Word Count [e,f]

			Predicted Group Membership		
		Review Outcome	Denied	Approved	Total
Training	Count	Denied	8	48	56
		Approved	10	134	144
	%	Denied	14.3	85.7	100.00
		Approved	6.9	93.1	100.00
Validation	Count	Denied	19	69	88
		Approved	7	205	212
	%	Denied	21.6	78.4	100.00
		Approved	3.3	96.7	100.00

e. 71.0% of training cases correctly classified
f. 74.7% of validation cases correctly classified

A discriminative variable such as the total word count is simple, easy to calculate and use, and as demonstrated here, when combined with other context specific variables it can become a powerful discriminative model.

Our study is limited by the fact that a single clinical site provided the referrals for the study. Furthermore, a preliminary communication analysis of the words used by the referring providers seems to provide more robust and discriminative characteristics that could be used to enhance the discriminative power of the word count alone in future studies. Also, an analysis by specialty service may prove useful in highlighting differences in the way referrals are reviewed by the different services. Future studies should aim to include a larger number of potential discriminative variables; also researchers should take advantage of local existing indicators that may prove to be strong discriminative variables at their particular settings. Results of the present study illustrate how simple indicators may help to improve complex healthcare processes such as referrals.

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RESEARCH PROJECT SUMMARY

The three articles presented as part of this dissertation represent the first step towards the development of a sound body of research and knowledge about referrals in healthcare. First, by formally defining what a referral in healthcare is, we believe practitioners, researchers and managers alike will benefit from being able to use the provided common ground in their work; second, using the proposed model in combination with the evaluation framework we can now begin to conduct true comparative research and improve referrals more effectively. Finally, as hinted by the third article, the potential for constructing statistical models can help improve referrals by providing practical ways of assessing referrals in a particular context.

The work described by the three papers in this dissertation is part of a larger and more comprehensive referral research agenda. As part of this larger research project we conducted an ethnographic study to analyze and further understand referrals. The ethnographic study we conducted at the selected clinical site resulted in a rich data set yet to be fully exploited. This large data set includes data from more than 40 informal interviews and 15 semi-structured interviews with the various agents directly involved in the referral process. These agents included physicians, nurses, and other primary and specialty care providers, as well as supporting staff. The qualitative analyses of these interviews as well as the analysis of more than 70 documents and notes taken from observations during more than 22 weeks in the field documenting the referral process illustrate the need for carefully analyzing the referral context in order to improve referrals. Our ethnographic study identified several themes that will be the focus of our

attention in subsequent manuscripts. Of particular value, was the workflow analysis that resulted from the referral context analysis performed at the clinical site. The workflow analysis identified critical communication breakdowns in the referral process that were present but not accounted for in the formal referral process workflow. For example, primary care providers communicated their referrals using the electronic medical record in place at the community clinics; however, the specialty services communicate the results of the referral encounters using paper records. Although both agents, the referring provider and the specialist, are communicating, they are using different mediums of communication and thus their message gets lost. Primary care providers do not receive the specialists' messages because they don't have access to the paper records and are left having to query the patient in the next encounter to learn about their encounter with the specialist.

Also, by identifying themes and coding the qualitative data set that emerged from the ethnographic study we were able to create several taxonomies of many referral context-specific constraints that invariably will affect how the referral process occur. Some of these constraints include the breakdowns in referral communication perceived by providers, inappropriate reasons for referrals, useful indicators of successful referrals, referral expectations from referring providers, referral expectations from the specialty services/providers, and perceived problems with the information systems used to support referrals. These themes and the resulting taxonomies potentially represent common barriers and problems shared by different referral environments. We will continue our work towards validating these taxonomies in different referral environments.

As it was described in the third article we collected 500 random referrals and associated information. Apart from using this data to develop the prediction model discussed in this dissertation, we analyzed each referral from a communication's perspective. This communication analysis indicates, for example, that referrals written using a communication strategy of instructing action have a higher acceptance rate (83%) and thus a better outcome, in other words when referring providers specifically indicate what they would like the secondary service/provider to do with and/or for the patient their referrals tend to have a better outcome in the referral process. This is an important finding if we consider that less than half of the referrals we analyzed were written using a strategy of instructing action. Other communication strategies used by providers in our sample had acceptance rates lower than 65%.

After this initial work, we are now prepared to start further exploring the large rich referral data set this research has been able to collect/create. Our research agenda as we have discussed included quantitative and qualitative approaches to both collecting and analyzing data; thus the referral data set we now have is rich and robust and will allow us to continue testing and exploring new research hypothesis related to referrals. Future studies will address these and many other findings that emerged from our research.

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