Diffusion of Prediabetes Information through Healthcare Facilities

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Table of Contents

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Abstract

Background. Prediabetes is defined as a condition that develops when a patient's blood sugar level falls between the normoglycemic and diabetic range. Prior research suggests that the loss of ten percent of body mass in a pre-diabetic patient may eliminate or prolong the onset of diabetes. However, a recent study conducted shows that physicians do not know how to diagnose prediabetes. This current investigation explores the spread of prediabetes information through the perspective of the diffusion of innovation theory. *Methods.* A secondary analysis of the physician assessment on diabetes knowledge established the problem. A follow-up survey was distributed to physicians to explore the effectiveness of communication sources. *Results.* The presence of barriers to information is associated with less time researching a topic. The most frequently used medium is internet, and the more sources that are used when researching the topic is correlated to a higher perception of knowledge on prediabetes. A physician will attend an information session run by a physician that he admires regardless of the topic. *Conclusion.* A secondary analysis established that physicians are not correctly diagnosing prediabetes. The follow-up survey suggests confirmation of three hypotheses, hypotheses: (1) physicians are less likely to spend time researching a topic when a barrier is present, even if they perceive ease in accessing medical information, (2) physicians who use more information sources perceive that they are more informed, and that the internet is the most effective medium when researching medical information, and (3) physicians are more likely to attend an information session run by a physician they admire, regardless of the topic.

Introduction

Medicine is a rapidly evolving field. Each day new research is being conducted and is either accepted or rejected by the medical community. However, with the large volume of new information that is being produced, the problem of diffusing the pertinent information to practicing physicians becomes more and more challenging. Using the diffusion of innovation theory perspective, this study addresses the specific problem of the diffusion of prediabetes information through healthcare facilities.

"In a field where the flux of ideas is as rapid as it has been in medicine in the last three decades, the "old" knowledge and technique that needs to be discarded may be only four or five years old; it may even be last year's innovation (Coleman, Katz, & Menzel, p.9)." Due to this flux, the scientific community's norms are welcome to new medical innovations (Coleman et al., 1966, p.8). The diffusion of innovation is critical in all areas, but even more critical when dealing with healthcare. If there is information that is crucial in saving lives that information should theoretically be diffused the quickest. By why isn't it?

Prediabetes is a term that is identified to be the stage at which a person is between normal blood sugar levels and diabetic blood sugar levels. When a person is in the prediabetic stage, if they are able to lose ten percent of their body mass they may be able to eliminate any chance of developing diabetes in the future – or at least prolong the diagnosis. Properly diagnosing a patient in the prediabetic stage is a crucial intervention in lowering diabetes incidences, which allows patients to live a healthier life. Therefore we need to know how knowledgeable physicians are in prediabetes, where physicians are getting their information and if that information is up-to-date on the procedures to treat

prediabetes, as well as the most common and effective communication medians in diffusing new medical innovations.

This research addresses how physicians gain information about prediabetes. The research includes both qualitative and quantitative approaches. The qualitative analysis compares the responses of medical education directors to the physician responses. The quantitative research analyzes physician responses to questions about information access and social networks. Specifically, the study will identify the problem, and then proceed to examine the sources of information use, including professional journals, other physicians (their professional network), training programs and other sources.

Literature Review One: Diffusion

Diffusion of Innovation Theory

In order for successful adoption of innovations to occur, it needs to begin with successful diffusion of that innovation (Haider, 2005, p. 2). Haider states that diffusion is a type of communication where messages are new concepts, practices or products. The communication of messages means the spread of information among people to reach a mutual understanding (Haider, 2005, p. 9). The diffusion of information (DOI) theory, explained by Haider uses social roles, norms and networks to explain behavioral changes. This theory was introduced forty years ago by Everett Rogers, on the premise that "diffusion is defined as a process by which an innovation is communicated through certain channels over time among the members of a particular social system. Diffusion is also a type of social change, that is, a process by which change occurs in the structure and function of a social system (Haider, 2005, p. 2)."

According to Haider, DOI has four main factors: the innovation, communication channels (multiple), specific social systems, and period of time. Along with the four elements, there are five main stages. The first stage is knowledge. In this stage, the individual acknowledges the existence of the new idea and there is some understanding of it. The second stage is persuasion where the person has developed a positive or negative attitude or emotion toward the innovation. The third stage is decision where the individual then chooses to adopt or reject this new innovation. The fourth stage is implementation where the individual incorporates the innovation to their daily routine. The fifth and final stage is confirmation where the individual is seeking reinforcement or confirmation of the innovation when there are any inconsistencies with messages that

appear. DOI categorizes people into five separate types by their roles and timing in the innovation adoption process (Haider, 2005). The first category is those who begin the adoption process – the innovators. As the time it takes for people to complete the adoption process increases, the people fall into the early adopters category, then the early majority category, to the late majority category, and the last people to adopt are considered to fall in the laggards category (Haider, 2005).

The diffusion of information for physicians begins with the collecting of all the new medical information that is received. The problem for the physician is not necessarily the accessibility of new medical information, but rather sifting through all new medical innovations and assessing the appropriate information (Coleman et al., 1966, p. 9). Medicine is a rapidly evolving field, and since knowledge and technique can be discarded rather rapidly, "the medical practitioner therefore has reason to be skeptical of the host of major and minor innovations that are urged on him each year (Coleman et al., 1966, p. 9)." Due to the volume of new medical innovation, even good changes can be resisted when first presented (Coleman et al., 1966, p. 9). Therefore it can take months, even years, before well supported research has been deemed worthy to be fully accepted (Coleman et al., 1966, p. 9).

In addition to the difficulty of sorting through new medical innovations, the physician runs into another obstacle – time (Coleman et al., 1966, p. 10). Physicians spend a lot of their time seeing patients, which leaves them even less time to sort through information that is presented to them. The goal of diffusion in the physician community becomes two-fold: first is the need for a higher likelihood of adoption when the

innovation is good, and second is the ability to reject an innovation when it can cause harm (Coleman et al., 1966, p. 9).

DOI has several limitations. DOI places blame on the individual for the rejection of the innovation, rather than considering the individual as part of a larger social system (Haider, 2005). For example, the individual physician would be to blame for the rejection of the innovation, rather than the network of physicians within the same physician community. In addition, DOI does not take into account that different socioeconomic classes may not benefit equally from the innovation (Haider, 2005). DOI also is criticized for having a pro-innovation bias; therefore it assumes that innovation should be diffused (Haider, 2005).

Schema Theory

The schema theory model is defined within a study conducted by Patricia Carrell and Joan Eisterhold (1983). "One of [schema theory's] fundamental tenets [is] that text, any text, either spoken or written, does not by itself carry meaning. Rather, a text only provides directions for listeners or readers as to how they should retrieve or construct meaning from their own, previously acquired knowledge."(Carrell & Eisterhold 1983, p. 556).

Knowledge that a person already has is considered to be background knowledge. The interaction between this background knowledge and the information that a person reads will determines how that person will interpret the information that is presented to him (Carrel & Eisterhold 1983). The process of interpretation is led by the ideology that every input is compared to existing background knowledge (Carrel & Eisterhold 1983).

There are two types of processing methods that can occur: bottom-up and top-down. Information is arranged in a hierarchy. Within this hierarchy, more general information is located at the top, while more specific information is located at the bottom. Bottom-up processing occurs when specific information is given and a person will then fit that information to a more generalized body of knowledge that they know. Top-down processing occurs when specific information is to be drawn from a generalized body of knowledge. Both processes should be occurring simultaneously (Carrel & Eisterhold 1983). This theory assumes that people process information using both the stimuli that is received against their existing background knowledge.

Identifying Effective Communication Channels

When an innovation is deemed safe and beneficial, effective communication is necessary in order to assist physicians in recognition that the innovation presented to them is indeed safe and beneficial to their patients. "The point is that messages are often judged first and foremost not by content but by source: who is telling me this, and can I trust them? (Bennett & Calman, 1999)." Trust is not one-dimensional; rather it consists of people's perceptions of: competence, objectivity, fairness, consistency, and good will (Bennett & Calman, 1999). If people are not able to trust a source, than any message from that source will be dismissed by that individual (Bennett & Calman, 1999).

Different media sources are better at dissemination of information depending on when the innovation is introduced. At the awareness stage, when the innovation is first introduced, mass media is most effective because it causes potential for adopters to become aware of the innovation (Coleman et al., 1966). However, in later phases, mass

media can also be proven effective in legitimizing the decision to adopt and innovation (Coleman et al., 1966). During the evaluation phase, when individuals are deciding when to adopt informal sources are more appropriate (Coleman et al., 1966). Adoption is more likely to occur earlier when media are used correctly, versus when media are used inappropriately (Coleman et al., 1966). However, it is nearly impossible to know the exact sequence of media used and when (Katz, 1971).

Social structure and networks can provide insight to effectiveness of diffusion through interpersonal communication. "Sociometry provides one means for mapping the structure of interpersonal relations in order to determine their impact on individuals occupying different positions within them and to examine their role as potential paths for the flow of innovation." (Katz, 1971, p. 770). Along the same lines of social mapping, Uzzi and Lancaster, (2003) provide more communication ideas through the examination on how knowledge is transferred within an organization, and how social networks (informal ties) influence this transfer.

"Doctors constitute communities, more or less tightly interconnected; stimuli that impinge upon any member of the community are likely to set in motion processes that will with varying degrees of speed and thoroughness, pervade the rest of the community. (Coleman et al., 1966, p.71)." The physician community can act as a strong support for physicians to discuss simultaneous dilemmas and problems of staying up-to-date (Coleman et al., 1966). The physician's network can vary depending on where he chooses to practice. The larger teaching hospitals with medical schools and research departments attached tend to have physicians that occupy the more central location of a social network (Coleman et al., 1966). Physicians that are isolated by working in small

clinics or individual practices tend to occupy peripheral locations in the social web (Coleman et al., 1966).

Adoption may be more likely in more integrated groups, because the communication among physician colleagues allows the innovation to spread collectively – therefore lowering the individual risk an adopter must take when adopting a new innovation alone (Coleman et al., 1966). There is a "group decision" that seems to occur between the physicians that agree to adopt together (Coleman et al., 1966).

If or when physicians choose to practice on their own and move away from the larger teaching hospitals they are less motivated to find time, or exert large efforts necessary to stay up-to-date (Coleman et al., 1966). This finding can be supported by applying the Schema Theory. Although schema is not specifically defined, Graber stated this useful definition, "In a nutshell, a schema is a cognitive structure consisting of organized knowledge about situations and individuals that has been abstracted from prior experiences. It is used for processing new information and retrieving stored information." (Graber, 1988, p. 28). This definition has been used by social scientists because it helps to demonstrate how people process information. (Severin 1992). In addition, Fiske and Kinder coin a term 'cognitive misers', which describes how people use simplified mental models to process information (1981).

Availability of information of a new medical innovation is not enough to make the innovation become adopted (Katz, 1971). Other factors must also be at work to explain the reason for adoption and the differences in time of the adoption (Katz, 1971).

A Diffusion Study

An appropriate method in researching the diffusion of innovation consists of one, a given new practice, two, time, three, channels of communication, and four analysis of social structure (Katz, 1971). "There are surprisingly few studies of the diffusion of innovation in the sense of tracing the movement of 1) a given new practice; 2) over time; 3) through specific channels of communication, and 4) within a social structure (Katz, 1971, p. 761).

A given new practice is the concentration on a single product. That product needs to highly recommended by competent scientific authorities and contains a central importance to the physician community in which the diffusion is to occur (Katz, 1971). Time is used to track the diffusion. There should be an element that can trace the innovation through time. The channels of communication also need to be identified. Although "it is impossible to get at the sequence of media use[d]," it is possible to identify which ones were used (Katz, 1971, p. 768). Social structure can "be seen as networks of interpersonal communication and, in this sense, obviously, the concern for channels of communication and for social structure coincides (Katz, 1971, p. 769). Sociometry is a method for mapping the structure of interpersonal relationships (Katz, 1971). This method is able to determine an individual's impact on the rest of the social network because of the different positions that individuals occupy in the social web (Katz, 1971). Sociometry can also be used to examine potential paths for the flow of innovation.

The following study is a good example of a well organized diffusion study that focused on the relation of group membership to adoption (Katz, 1971). The Coleman, Menzel, and Katz study (1966) traced the diffusion of a prescription drug through the physicians that prescribed it, used both recollection of the new innovation by physicians

and the physical evidence of the prescriptions. The tracing of the physical paper trail allowed them a means to track the diffusion over time without the data being skewed by social responses.

Their design can be identified in three processes. The first process was the identification of a physician within their social web. The next process was to interview all the doctors of the particular specialty that would prescribe the new drug -- gammanym. The third and final process was to audit the prescriptions of gammanym and other drugs that were similar in effect.

The data that was obtained through the interviews consisted of the 1) the physician's medical and non-medical history; 2) the physicians orientation and attitude towards various aspects of medicine and toward his communication; 3) the exposure to various formal and informal sources of information pertaining to the new drug; 4) the physician's own account of influences affecting his decision to adopt; 5) the general use of the family of drugs that gammanym is part of and treatment of specific conditions that requires the use of these types of drugs; 6) the physician's relationship to other doctors within the local community in the forms of friends, informal consultants, and advisors (Coleman et al., 1966). "It is important to emphasize the limitations of these subject's accounts. The doctors have their own – correct or incorrect – ideas about the relative influence of the various channels of communication inevitably these preconceptions will affect their ability to reconstruct exactly what happened in any specific instance (Coleman et al., 1966, p.51-52)."

There were five stages that a physician progressed through before they officially adopted (Coleman et al., 1966). Awareness of the new medical innovation came first.

Curiosity and interest in the new innovation followed. The physician would then begin to test the innovation in a mental trial. If the innovation passed the mental trial, it would move onto applying the innovation to practice – prescribing the drug. Once the innovation is applied, it will stay in the trial phase until the physician decides to adopt or dismiss the new innovation (Coleman et al., 1966).

There were several characteristics that they found amongst the physicians. The type of facility that a physician practices can effect the rate of diffusion (Coleman et al., 1966). For example, a large teaching hospital connected to a medical school had more access to materials that would contain new medical innovations and relatively more controlled conditions (Coleman et al., 1966). Smaller facilities had less access to scientific materials that would contain new medical innovations (Coleman et al., 1966). Age also contributed to diffusion. "Older doctors [were] unwilling to try gammanym probably because their age is associated with a more conservative attitude or lower responsiveness to new developments (Coleman et al., 1966, p.107)." Physicians that were considered innovators tended to fall within the middle-age bracket (Katz, 1971). Journal readings also increased the likelihood to adopt a new medical innovation (Coleman et al., 1966). The more that physicians read, the more likely they are to be exposed (Coleman et al., 1966). However, in this study, they noted that the number of gammanym articles that were published over the time of diffusion did not radically increase (Coleman et al., 1966).

Two social networks that were examined were the: advice network and the colleague network (Coleman et al., 1966). It was found in the advice network that advisees followed their advisors, and the reverse was also true – the advisor would follow

their advisee (Coleman et al., 1966). The rationale behind the first case, is that an advisee will look up to their advisor. Therefore, if the advisor chooses to adopt, the advisee will soon after choose to adopt as well. The reverse happens as well. This is because, advisors will sometimes ask their advisee to play a "scout" and scope out the innovation before the advisor chooses to adopt (Coleman et al., 1966).

"It is the doctors who are most integrated, both formally and informally, both inside the local community and outside, who are in the vanguard of medical innovation (Katz, 1971, p. 790). Physicians that are located in the periphery of their social network were still affected by that network; however, that effect came later than those that occupied central positions (Coleman et al., 1966). Therefore, physicians who are close with their colleagues are more integrated into a stronger network of communication over the physicians that are not as close with their colleagues (Coleman et al., 1966). The physicians that are close with their colleagues, tend to occupy more central spots in the social network (Coleman et al., 1966). However, "it could be that the effect is in the opposite direction: that doctors who are innovators come to occupy central positions in the networks (Coleman et al., 1966, p.92)." Physicians that are isolated and not close to their colleagues tend to occupy more peripheral spots in the social network (Coleman et al., 1966). The rate of diffusion curve amongst integrated physicians was a steep upward trend reaching its peak in eight months, while the curve for the isolated doctors rises at a constant rate (Coleman et al., 1966).

It is found that early adopters relied more heavily on their colleagues (Coleman et al., 1966). In addition, they tended to channel the message through means of interpersonal communication (Coleman et al., 1966). Physicians that occupied the same

level in the social network adopted the innovation at the same time (Coleman et al., 1966). The early adopters were influenced by mass media as well as the outside community (Coleman et al., 1966). They were more likely to attend out-of-town meetings and to visit out-of-town institutions, as well as subscribe to more medical journals (Coleman et al., 1966). Physicians that were more innovating tend to measure themselves by their colleagues rather than their patients (Coleman et al., 1966).

Later adopters are influenced by relatives, friends and neighbors (Coleman et al., 1966). They do not act simultaneously to other physicians that are located in the same level in their social network (Coleman et al., 1966). The channels identified by early and late adopters are mostly the same sequence of sources of influence (Coleman et al., 1966). However, the time of the diffusion is at a greater rate of speed in early adopters (Coleman et al., 1966). "It is impossible to distinguish between early and late adopters on the basis of their self-reports. (Coleman et al., 1966, p.63)."

Highlights. Physicians acted as communities, not just as unrelated individuals (Coleman et al., 1966). The new drug reached physicians that were more integrated in their social network, not only earlier, but through a different diffusion process (Coleman et al., 1966). The diffusion process within an integrated physician network emulated that to the chain reaction of infectious diseases (Coleman et al., 1966). "As in many epidemics, the "transmission" of gammanym use from doctor to doctor was no doubt, accompanied by the continuing "infection" of some doctors through contacts from the outside: journals, meetings, and the like (Coleman et al., 1966, p.11)."

Literature Review Two: Prediabetes

Diabetes is a chronic disease that can lead to other medical conditions and even morbidity if not treated. However, there are treatment options for a patient that is found to be in the prediabetic range that can essentially decrease the risk for the patient from developing diabetes. If patients are in the prediabetic range, there are treatments that can be used and effective, but only before the patient hits the diabetic range (of 126 mg/dl).

In November 2003, the American Diabetes Association changed the ranges for diabetes and created another category called prediabetes. The information about prediabetes can be found in numerous diabetes websites as well as diabetes magazines. In addition, a study conducted by G. D. Smith, Y. Bracha, K.H. Svendsen, J.D. Neaton, S.M. Haffner, and L.H. Kuller (2005), published in the Annals of Internal Medicine, found that diet and exercise significantly reduces the risk of prediabetic patients developing diabetes in the future. The diffusion of prediabetes knowledge could diminish the incidents of diabetes.

However, I assisted in research conducted – in the summer of 2006 by S. Sigworth, A. Wiener, S. Talavera, and C.R. Horowitz – to identify if physicians are aware of prediabetes. According to a secondary analysis performed on the data collected physicians are not recognizing prediabetes. The secondary analysis performed on the survey conducted was used to establish the problem that physicians are not aware of prediabetes. The following information provides the background information of the survey that was conducted this past summer.

The survey was distributed in four healthcare facilities: two hospitals (one with a medical school attached), two community health centers. Internal medicine physicians, residents, nurse practioners, geriatric physicians, geriatric fellows, and geriatric nurse practioners were surveyed within these four facilities. These specialties were surveyed because of their primary role in the prevention, diagnosis, and treatment of diabetes. The surveys were internal review board (IRB) exempted from two of the hospitals that were surveyed; therefore a consent form was not distributed. Four surveys were distributed at one of the community health centers with one returned. Six were distributed at the other community health center with six returned. 30 were distributed at the hospital without the medical school attached with 26 returned. 215 were distributed at the hospital with the medical school attached with 112 surveys returned.

The surveys were distributed in person; the physician was asked to take a couple of minutes to complete the survey. If they were unavailable at that particular time, then they were given the option to take the survey at their convenience and send it back for collection.

There were three different versions of one scenario question on the survey that circulated – the remainder of the questions were the same for each survey. Each physician was given one scenario, which was selected by systematic random sampling. One scenario displayed a patient with blood glucose levels, on two occasions, of 96 mg/dl and 99 mg/dl, which is normoglycemic. Scenario two had a patient with blood glucose levels, on two occasions, of 102 mg/dl and 108 mg/dl, which is prediabetic. Scenario three had a patient with blood glucose levels, on two occasions of 126 mg/dl and 135 mg/dl, which is diabetic. The rotating scenario was to discourage physicians from

sharing answers when surveys were distributed in groups. (Please see Appendix A for the clinician survey on diabetes care).

Results of Secondary Analysis: Clinician Survey on Diabetes Care.

146 physicians responded to the survey. The clinician survey on diabetes care served as an assessment of the current physicians' knowledge. Five questions identified how accurately physicians diagnose diabetes. One of the questions was based on a rotating scenario with different blood sugar levels, and the other four were asking physicians to answer blood sugar levels for a patient with 1) normal fasting blood sugar levels, 2) normal post-prandial blood sugar levels, 3) diabetes fasting blood sugar levels, and 4) diabetes post-prandial blood sugar levels.

A chi-square analysis found that a significantly more physicians accurately diagnosed the patient in the scenario. Of the 137 physicians who responded, 56 did not diagnosis the patient in their scenario correctly, while 81 did. (p=.033). The percentage of physicians that got the scenario correct was 59.1%, while the percentage of physicians that got the scenario incorrect was 40.9%.

Chi-Square Test: Physician Responses to the Rotating Scenario

Testing if the physician was correct or incorrect with their responses.

Diagnosis

	Observed N	Expected N	Residual
Not Correct	56	68.5	-12.5
Correct	81	68.5	12.5
Total	137		

Test Statistics

	Diagnosis
Chi-Square(a)	4.562
Df	1
Asymp. Sig.	.033

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 68.5.

To assess the physician responses to each of the four types of blood sugar levels, a one-sample t-test was performed on each of the four levels. The standard glucose level for each of the four categories of responses was tested against the corresponding mean of the physician responses of that category. The t-test results were significant for normal fasting (p=.006), diabetes fasting (p=.003), and diabetes post-prandial (p=.000); however, the t-test results were not significant for normal post-prandial (p=.118). To further examine these findings, the physician responses were broken down into three categories: responses below the standard glucose level, correct glucose level, and above standard glucose level.

T-test Analysis:

The figures below correspond to physician responses when asked to state the specific sugar levels of each of the following conditions: 1) Normal Fasting Level, 2) Normal Post-Prandial Level, 3) Diabetes Fasting Level,, and 4) Diabetes Post-Prandial.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
1) Normal Fasting	139	105.54	23.210	1.969
2) Normal Post-Prandial	139	147.41	55.580	4.714

3) Diabetes Fasting	139	119.92	24.033	2.038
4) Diabetes Post- Prandial	139	166.76	60.978	5.172

One-Sample Test

	Test Value = 100					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
1) Normal Fasting	2.814	138	.006*	5.540	1.65	9.43

	Test Value = 140					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2) Normal Post-Prandial	1.572	138	.118	7.410	-1.91	16.73

	Test Value = 126					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
3) Diabetes Fasting	-2.982	138	.003	-6.079	-10.11	-2.05

	Test Value = 200					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
4) Diabetes Post-Prandial	-6.426	138	.000	-33.237	-43.46	-23.01

For normal fasting, approximately 10.8% of physicians reported glucose levels that were below the standard, ~32.4% reported the correct glucose levels, and ~56.8%

reported glucose levels above the standard. For normal post-prandial, ~25.2% of physicians reported glucose levels that were below the standard, ~25.9% reported the correct glucose levels, and ~48.9% reported glucose levels above the standard. For diabetes fasting, ~28.8% of physicians reported glucose levels that were below the standard, ~64.7% reported the correct glucose levels, and ~6.5% reported glucose levels above the standard. For diabetes post-prandial, ~39.5% of physicians reported glucose levels that were below the standard, ~58.3% reported the correct glucose levels, and ~2.2% reported glucose levels above the standard.

Percentage of Physician Responses: Below, Above, and at the Standard Glucose Level

Total (N=146) Valid (N= 139) Missing (N=7)	Percentage of Physicians Below Standard Glucose Level	Percentage of Physicians with Correct Glucose Level	Percentage of Physicians Above Standard Glucose Level
1) Normal Fasting	~10.8% (15/139)	~32.4% (45/139)	~56.8% (79/139)
2) Normal Post-Prandial	~25.2% (35/139)	~25.9% (36/139)	~48.9% (68/139)
3) Diabetes Fasting	~28.8% (40/139)	~64.7% (90/139)	~6.5% (9/139)
4) Diabetes Post-Prandial	~39.5% (55/139)	~58.3% (81/139)	~2.2% (3/139)

An independent sample t-test was performed to see if there was a gender difference in responses to how comfortable a physician is in teaching patients about diet, healthy eating, and exercise. The Levene's test had a result of .696, meaning that the equal variances amongst the group are assumed. The t-test displays a significant value of p=.093 which is less than p=.1. This shows that there is a statistical significance between

gender and the perceived comfort in teaching patients about diet, healthy eating, and exercise.

Independent Sample t-Test

The difference between gender and how comfortable a physician is in teaching patients about diet, healthy eating, and exercise.

Group Statistics

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Comfortable in teaching patients about diet, healthy eating, and exercise	Female	83	4.10	.900	.099
	Male	61	3.84	.911	.117

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Comfortable in teaching patients about diet, healthy eating, and exercise	Equal variances assumed	.15	.70	1.69	142	.093	.26	.15	-.04	.56
	Equal variances not assumed			1.69	128.6	.094	.26	.15	-.04	.56

Discussion of Secondary Analysis: Clinician Survey on Diabetes Care

The results of the secondary analysis show that information about diabetes and prediabetes is not circulating through the physician community as one would expect. The

five questions that serve to identify how accurately physicians diagnose diabetes resulted in significant findings, displaying an apparent communication break.

Through the individual t-test analyses of the four categories of blood sugars, all but one of the four categories reported significant results. With normal fasting blood sugar level, the standard is 100 mg/dl. The sample mean of responses from the physicians was 105.54 mg/dl. In addition, the percentage table shows that ~32.4% of physicians diagnosed it correctly, ~10.8% responded lower than the standard glucose level, and ~56.7% responded higher. These responses show that the majority of physicians believe that the normal blood sugar range is higher than the standard. Therefore, according to these findings, the majority of physicians diagnose patients as normal, even when they have elevated blood sugar levels. This could be detrimental because they are not diagnosing their patients as prediabetic and therefore a prevention intervention may not take place.

With normal post-prandial blood sugar level, the standard is 140 mg/dl. The sample mean of responses from the physicians was 147.41 mg/dl. In addition, the percentage table illustrates that ~25.9% of physicians diagnosed it correctly, ~25.2% responded lower than the standard glucose level, and ~48.9% responded higher. These responses show that the majority of physicians believe that the normal post-prandial blood sugar range is higher than the standard. These findings support that of the findings above, the majority of physicians will be diagnosing patients as normal, even when they have elevated blood sugar levels.

With diabetes fasting blood sugar level, the standard is 126 mg/dl. The sample mean of responses from the physicians was 119.92 mg/dl. In addition, the percentage

table illustrates that ~64.7% of physicians diagnosed it correctly, ~28.8% responded lower than the standard glucose level, and ~6.5% responded higher. These responses show that the majority of physicians were able to identify the correct blood sugar level for a diabetic patient's fasting blood sugar levels. In this case, it can be seen that sample mean was lower than that of the standard blood sugar level. Therefore, physicians are diagnosing patients with diabetes prematurely. This could mean that there is not an acknowledgement of the prediabetic range.

With diabetes post-prandial blood sugar level, the standard is 200 mg/dl. The sample mean of responses from the physicians was 166.76 mg/dl. In addition, the percentage table illustrates that ~58.3% of physicians diagnosed it correctly, ~39.5% responded lower than the standard glucose level, and ~2.2% responded higher. These responses show that the majority of physicians were able to identify the correct blood sugar level for a diabetic patient's fasting blood sugar levels. In this case, it can be seen that sample mean was lower than that of the standard blood sugar level. Therefore, these findings support that of the findings above, physicians are diagnosing patients with diabetes prematurely, which could mean that there is not an acknowledgement of the prediabetic range.

The last question that assessed the accuracy of a physician's diagnosis of diabetes was through the rotating scenario. The chi-square analysis reported that there was a significant finding of incorrect answers. In addition, 40.9% of physicians were not able to diagnosis the patient in the scenario correctly. However, 59.1% of physicians were able to diagnosis the patient in the scenario correctly. This again suggests that diabetes information is not known by nearly half of the physicians.

The last sample t-test analysis was between gender and their perceived comfort of teaching patients about diet, healthy eating, and exercise. The results suggest a relationship between gender and comfort in teaching patients about diet, healthy eating, and exercise than do male physicians.

The findings of the secondary analysis show that there is not proper diffusion of diabetes knowledge through this healthcare community. A second survey of physicians was conducted which asked physicians about medical information sources. The follow-up survey – the second survey – will serve to target the most effective information sources that diffuse new medical information. With healthcare information changing so rapidly, it is essential for healthcare professionals to stay up-to-date on the current procedures. More specifically to diabetes; diabetes is one of two diseases in this country that continues to grow in mortality rate, while other serious illness such as heart disease and cancer are seeing a decline. With this groundbreaking information of prediabetes being a malleable state in which a person can in essence reverse their fate to diabetes, physicians should want to have this very tool at their fingertips. Although the information is present, the mode in which it is diffused through an industry is just as important as the information itself. This research will help increase our understanding of the gaps in communication between the scientific community and the healthcare providers and consumers. This understanding will allow for the development of more theory based strategies for delivering science based information to healthcare providers.

Demographics

The physicians that were surveyed are from three healthcare facilities located within a large minority community. Residents in this minority community are poorer and experience more chronic disease and worse health outcomes than almost any other community within the same city (Chassin, 2001).

There are 118,000 residents, which 50% are Latino and 40% are black. This population "typifies many minority communities across the United States, in that her residents struggle with limited resources while bearing a disproportionate burden of chronic diseases (Chassin, 2001)." Adults within this minority community have the highest rates of all-cause mortality in the city (Chassin, 2001). In addition, the adults have the highest rates of diabetes and cerebrovascular mortality rates within the city (Chassin, 2001).

38% of this minority community's members live in poverty (Chassin, 2001). Less than 46% of them have high school educations (Chassin, 2001). 41% of them are uninsured (Chassin, 2001). 58% of them think that the neighborhood in which they live are unsafe (Chassin, 2001). 30% of them rate their health as being poor or fair (Chassin, 2001). 54/1000 is the diabetes death rate in this minority community (Chassin, 2001).

The most recent national healthcare disparities report concluded that disparities in both outcomes and processes of care are persistent (Chassin, 2001). Blacks received poorer quality of care than whites on 68% of measures, and they scored better than whites on zero accounts (Chassin, 2001). Hispanics received poorer quality of care than whites on 50% of measures, and they scored 11% higher on measures (Chassin, 2001). Blacks

had worse access to care on 35% of measures compared to whites, and better access to care on 10% of measures (Chassin, 2001). Hispanics had worse access to care on 90% of measures compared to whites, and better access to care on 3% of measures (Chassin, 2001). Lots of research has documented this magnitude of racial and ethnic disparities in health outcomes and health care across a wide variety of different conditions (Chassin, 2001).

Within this minority community there are three hospitals and two large community health centers (Chassin, 2001). One of the large hospitals has an attached medical school and is the largest provider of health services to the community (Chassin, 2001). In 2004, there were 400,000 outpatients within this facility – not all patients within the minority community, and 72,000 emergency department visits (Chassin, 2001). One of the other hospitals is a private, minority-owned and operated, not-for-profit community hospital (Chassin, 2001). In 2004, there were 83,000 outpatients within this facility – not all patients within the minority community, and 31,000 emergency department visits (Chassin, 2001). In part one: clinician survey on diabetes care, clinicians from the two hospitals (mentioned above) as well as the two large community health centers were surveyed. In part two: qualitative study, the individual in charge of medical education from the large hospital with the medical school attached, as well as one of the large community health centers were interviewed. In part three: clinician survey of medical information sources the clinicians from the large hospital with the medical school attached, as well as one of the large community health centers were surveyed.

Hypotheses

Hypothesis one: Physicians perceive that they have easy access to prediabetes information; however, they also perceive that there are barriers that prevent them from accessing updated medical information.

Physicians believe that they have easy access to prediabetes information. However, they also feel that barriers exist which prevents physicians from taking the extra step to take time to research a topic on their own. This hypothesis can be supported by the Schema Theory. Although schema is not specifically defined, Graber stated this useful definition, "In a nutshell, a schema is a cognitive structure consisting of organized knowledge about situations and individuals that has been abstracted from prior experiences. It is used for processing new information and retrieving stored information." (Graber, 1988, p.28).

This definition has been used by social scientists because it helps to demonstrate how people process information. (Severin, 1992). In addition, Fiske and Kinder coin a term 'cognitive misers', which describes how people use simplified mental models to process information (1981). In this case with physicians, it is possible that since they are 'cognitive misers', they may encounter a barrier and not take the extra step to spend time researching prediabetes on their own. Instead, they stick to processing the information the same way that they always did to avoid cognitive strain.

This hypothesis will be tested by an analysis of questions pertaining to how easy the physician feels it is to obtain up-to-date medical information, as well as examining the various types of barriers that physicians face that make it difficult for them to access up-to-date medical information. In addition, an analysis of the question of how often a

physician finds time to research a topic on his own will be correlated to the different barriers identified.

Hypothesis Two: Physicians who have higher levels of knowledge about prediabetes will use more information sources, participate in training more and be more closely connected to a professional social network. Conversely physicians with low knowledge about prediabetes will use fewer information sources, and not be linked as closely with professional information networks.

2A: Physicians will rate the internet as one of the most used sources of accessing up-to-date medical information because of its ease of use and accessibility.

Physicians who have higher levels of knowledge about prediabetes will use more information sources, participate in training more and be more closely connected to a professional social network. Conversely, physicians with low knowledge about prediabetes will use fewer information sources, and not be linked as closely with professional information networks. When dealing with the diffusion of information, it is important to look back at the Katz study (pertaining to the diffusion of an antibiotic) that was mentioned earlier on in this paper. This study was able to draw the following conclusions, "early adopters were more likely to attend out-of-town medical meetings in their specialties. The mapping of interpersonal relations made possible inferences regarding the effect of social relations in decision making." (Severin, 1992). These findings can support that of hypothesis two. If physicians have higher levels of knowledge, they probably sought out more information about the subject matter, as the Katz study indicates. Uzzi and Lancaster (2003) also provide more communication ideas

through the examination on how knowledge is transferred within an organization, and how social networks (informal ties) assist in this transfer.

This hypothesis will be tested using various questions pertaining to how informed a physician feels about prediabetes and how comfortable a physician feels with diagnosing prediabetes. This variable will be compared against the various media of communication available, as well as the spread and mean of physician responses to each individual median as a useful mode for communication.

Hypothesis Three: A physician will be more likely to attend an information session conducted by a physician that he admires regardless if he is interested in the topic or not.

If a physician identifies another physician as a person that they admire, he is more likely to attend an information session that the admired physician ran regardless of the subject matter. Therefore if an influential member of a social network has the correct information about prediabetes and held an information session, that member will be more able to disseminate that information to their social network because of their influence. The Newcomb's Symmetry Theory can be applied to this case. Newcomb's theory states that people try to influence on another to create symmetry in their surroundings (Severin, 1992). This theory also touches upon the idea that people tend to become friends with people that they share similar ideas with (Newcomb, 1953). This idea is also applicable because, to break the hypothesis down further, if one physician knows about prediabetes, their social cluster will also know. Therefore, it may be found that clusters of physicians that identify one another as friends will all know the same information.

The following information about opinion leaders can add more breadth to the last hypothesis mentioned. 1. Personal influence is more effective than mass media communication, 2. Interpersonal influence in groups leads to more homogeneity between the leaders and group members, and 3. Different media play different roles in the decision-making process (Severin, 1992). This information can be more applicable after the findings of the survey return. Since physicians will document the mode in which they receive their prediabetes information, it will then be identifiable if interpersonal communication was more effective in the diffusion of prediabetes information in healthcare communities.

This hypothesis will be examined by using physician responses to questions where they were to rate the likelihood that they were to attend a meeting that a physician that they admired ran, whether they were interested in the topic or not.

Methods

Qualitative Study

The qualitative study consisted of two interviews with the medical directors or personnel responsible for continual medical education at one of the community health centers and the hospital with the medical school attached, that the initial survey was distributed. A consent form was read to the participant over the phone, prior to initiation of the survey. If the participant agreed to partake in the study, the experimenter asked a series of questions (Please see Appendix B for the qualitative interview script). The interview lasted anywhere between five to twenty minutes, depending on the availability, as well as the depth of each response by the participant (Please see Appendix C for the transcripts of each interview).

Quantitative Research: Clinician Survey of Medical Information Sources

The survey was distributed in three healthcare facilities: one hospital with a medical school attached and two community health centers. Internal medicine physicians, residents, geriatric physicians, and geriatric fellows were surveyed within these three facilities. These specialties were surveyed because of their primary role in the prevention, diagnosis, and treatment of diabetes. Since the survey was distributed to all the specified physicians within the healthcare facilities, it was an attempt to survey an entire population of physicians. Therefore the resulting sample is self-selected and not random. The sample in this survey is a non-probability sample of the population, and the validity of the results are unknown.

The survey was distributed in person to the physicians at the community health centers. Before taking the survey, the physician was asked to sign a consent form stating

that they are aware that there is minimal risk to them as the participant, and that participation is completely voluntary. The physician was then asked to take the five to ten minute survey at that time, however, if the physician was unable to take the survey, they were given the option to take it at another time and return it with the post-marked envelope given to them at the time of original distribution. (Please see Appendix C for the clinician survey on medical information sources – version distributed to community health center). One survey was distributed in one of the community health centers with one returned. At the other community health center, four surveys were distributed with two surveys returned.

Distribution at the hospital with the medical school attached was through email – per request of the facility's institutional review board (IRB). The survey was designed on a secure surveying database with the link to survey given to the participant in the email. The first part of the online survey was the consent form. This question was set-up in a manner that it was mandatory for the participant to sign and date the electronic form in order to continue to the actual survey questions, assuring that there was consent. The rest of the survey was then completed online, and could be accessed through the secure surveying database. 202 surveys were distributed electronically with 14 surveys being kicked back to sender. A total of 188 surveys were distributed with 26 responses. (Please see Appendix D for the clinician survey on medical information sources – version for the hospital with the medical school attached, minor changes per request of the facility's IRB).

Results

Qualitative study

One person was identified as the medical education respondent (who is not a clinical physician) and was contacted within the hospital with the medical school attached to answer a series of questions. (To see the transcript of the conversation please see Appendix C). The mean of physician response was taken from the physicians that practiced within the hospital with the medical school attached. The following chart displays the results as a comparative between the response of the medical education respondent and the physicians practicing within the facility.

Hospital with Medical School Attached

	Medical Education Respondent	Mean of Physician Response
The most common and serious medical condition that impacts the health of the community in which your facility is located?	Heart Disease	5.5 (out of 6) Heart Disease, N=24 However, 5.79 (out of 6) Diabetes, ranking it number 1 to physicians
Does your medical facility provide continuing education programs for physicians on sight?	Yes	95.7% (N=22) stated “Yes”, and 4.3% (N=1) stated “Not Sure”, Total N=23
Is the participation for these programs mandatory?	Yes	34.8% (N=8) stated “Yes”, 56.5% (N=13) stated “No”, and 8.7% (N=2) stated “Not Sure”
Quality of the Program	----------	39.1% (N=9) stated 4 (out of 6) 30.4% (N=7) stated 5 (out of 6) 13% (N=3) stated 3 (out of 6) 13% (N=3) stated 6 (out of 6)

Do you feel that your physicians are up-to-date with all new medical changes?	"Everybody could use improvement"	----------
How would you say that they keep themselves up-to-date, do you believe it is mostly through your office?	"No. They attend national meetings, region programs, grand rounds"	The physicians identify the sources: (N=24) 1) Medical Journals 5.25 out of 6 2) Internet 5.17 out of 6 3) Colleagues 3.87 out of 6 4) Medical Information Sessions 2.78 out of 6
Has your facility had any trainings on prediabetes?	"Four. And we maintain a website.", "Excellent Turnout"	7 physicians attended o sessions 6 physicians attended 1 session 6 physicians attended 2 sessions 3 physicians attended 3 or more sessions

One person was identified as the medical director (who is a practicing clinical physician) and was contacted within one of the community health center to answer a series of questions. (To see the transcript of the conversation please see Appendix C). One physician responded to the survey from this community health center, and that physician's response was recorded. The following chart displays the results as a comparative between the response of the medical director and the physician practicing within this community health center.

Community Health Center

	Medical Director (an MD)	Physician Response (N=1)
The most common and serious medical condition that impacts the health of the community in which your facility is located?	Obesity Asthma	6 (out of 6) Heart Disease 6 (out of 6) Diabetes 6 (out of 6) Obesity 6 (out of 6) Asthma 6 (out of 6) HIV/AIDS

Does your medical facility provide continuing education programs for physicians on sight?	Yes	Yes
Is the participation for these programs mandatory?	No	No
Quality of the Program	----------	6 (out of 6)
Do you feel that your physicians are up-to-date with all new medical changes?	"As up-to-date as they can be, yes."	----------
How would you say that they keep themselves up-to-date, do you believe it is mostly through your office?	Attending conferences, discussing with colleagues	The physician identify the sources: 1) Colleagues 6 (out of 6) 2) Textbooks 5 (out of 6) 3) Internet 4 (out of 6) 3) Medical Information Sessions 4 (out of 6) 3) Medical Journals 4 (out of 6)
Has your facility had any trainings on prediabetes?	No	Physician attended 1 information session on prediabetes elsewhere.

Quantitative Research: Clinician Survey of Medical Information Sources.

Results of hypothesis one. To assess the physician responses on the number of years a physician has been practicing, and how easy it is to access up-to-date medical information, a correlation between the two variables was performed. The variable of how easy it is to access up-to-date medical information was rated on a scale of one through six: one representing easy to access up-to-date medical information and six being difficult to

access up-to-date medical information. No significance was found r (22) = .375, and since a 2-tailed test was performed, p=.086 which is greater than p<.05 making the results not significant.

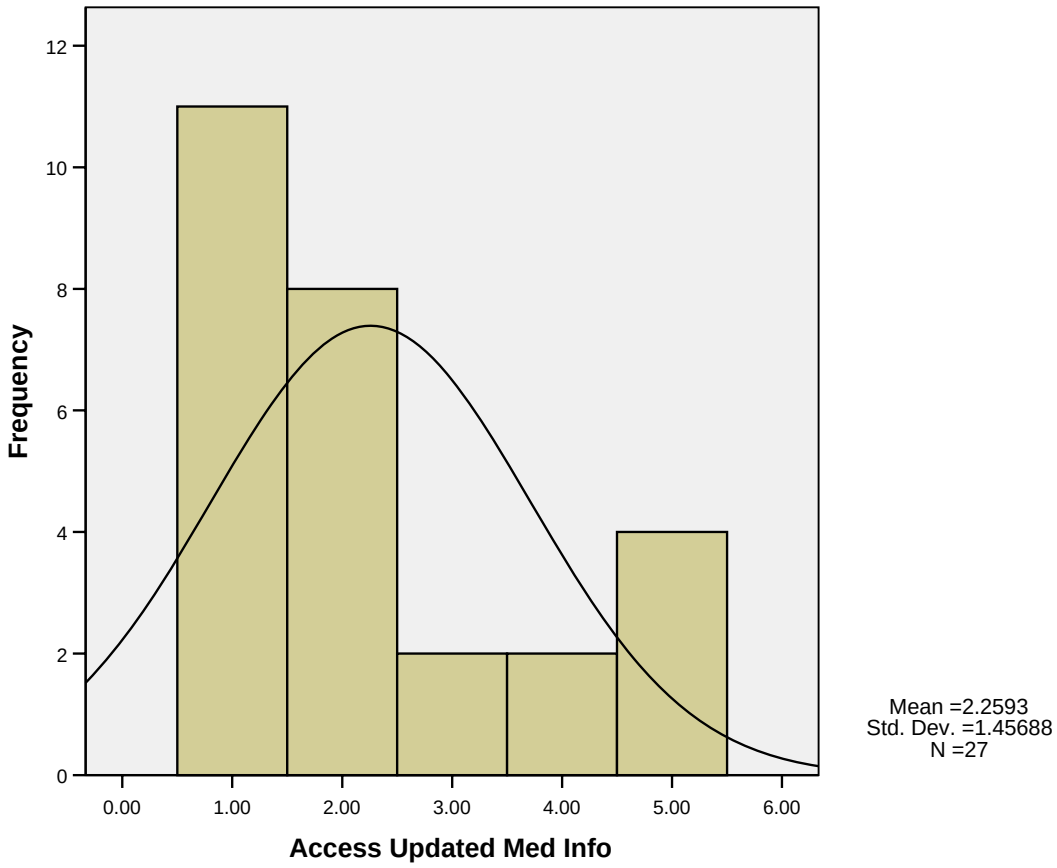
Correlation:

The figure below compares physician responses when asked to rate (on a scale of 1-6) how easy it is to access up-to-date medical information to the number of years they have been practicing medicine.

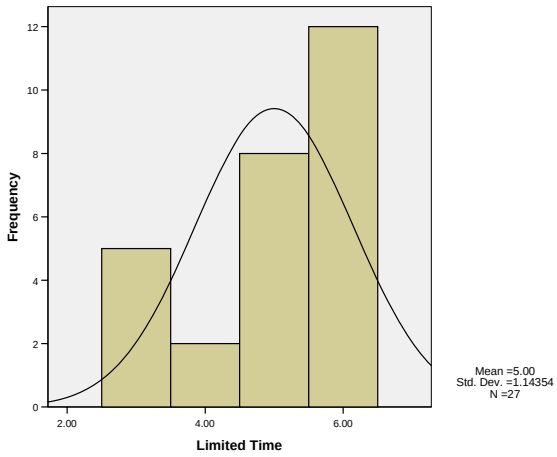
Correlations

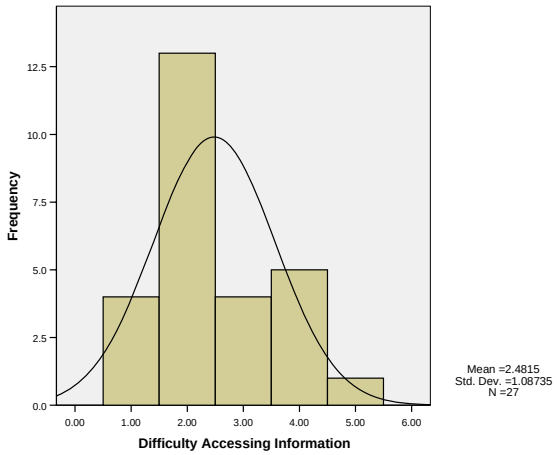
		Number of Years Practicing	Access to Up-to-date Medical Information
Number of Years Practicing	Pearson Correlation	1	.375
	Sig. (2-tailed)		.086
	N	23	22
Access Up-to-date Med Info	Pearson Correlation	.375	1
	Sig. (2-tailed)	.086	
	N	22	27

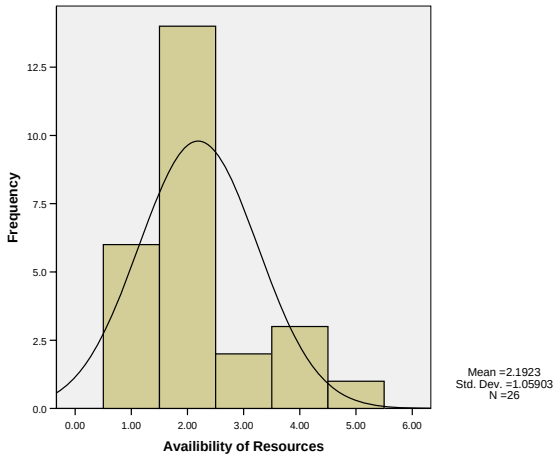
The variable representing easy to access up-to-date medical information rated on a scale of one through six: one representing easy to access up-to-date medical information and six being difficult to access up-to-date medical information, produced the following histogram. The normal curve is plotted on the histogram to display how the results are not normally distributed.



Three barriers (limited time, difficulty accessing information, and availability of resources) produced the three histograms below. Each of these variable was assessed on a scale of one through six: one being never a barrier and six being very often a barrier. The higher the mean, the more often the barrier impeded the physician's ability to access up-to-date medical information. Limited time had a mean of five, showing that it was identified as the number one of these three barriers that affected the physician's ability to access up-to-date medical information.







Correlations were performed for each of the barriers (limited time, difficulty accessing information, availability of resources) against how informed a physician felt they individually were on prediabetes. None of these correlations displayed significant findings. The correlation for limited time against feeling informed about prediabetes was r (26) = -.012 where p=.955 which is greater than p = .05. The correlation for difficulty accessing information against feeling informed about prediabetes was r (26) = -.052 where p=.801 which is greater than p = .05. The correlation for availability of resources against feeling informed about prediabetes was r (25) = -.098 where p=.641 which is greater than p = .05.

Correlations:

The figures below compare physician responses when asked to rate (on a scale of 1-6) three different barriers when keeping up-to-date with new medical information and how informed they feel about prediabetes.

Correlations

		Feel Informed about Prediabetes	Limited Time
Feel Informed about Prediabetes	Pearson Correlation	1	-.012
	Sig. (2-tailed)		.955
	N	27	26
Limited Time	Pearson Correlation	-.012	1
	Sig. (2-tailed)	.955	
	N	26	27

Correlations

		Feel Informed about Prediabetes	Difficulty Accessing Information
Feel Informed about Prediabetes	Pearson Correlation	1	-.052
	Sig. (2-tailed)		.801
	N	27	26
Difficulty Accessing Information	Pearson Correlation	-.052	1
	Sig. (2-tailed)	.801	
	N	26	27

Correlations

		Feel Informed about Prediabetes	Availability of Resources
Feel Informed about Prediabetes	Pearson Correlation	1	-.098
	Sig. (2-tailed)		.641
	N	27	25
Availability of Resources	Pearson Correlation	-.098	1
	Sig. (2-tailed)	.641	
	N	25	26

Correlations were performed for each of the barriers (limited time, difficulty accessing information, availability of resources) against how often a physician had time

to research a topic on his own on a scale of one through six: one being not often and six being very often. Both difficulty accessing information and availability of resources were barriers with significant findings when correlated to how often a physician has time to research a topic, however, limited time was not a significant finding. The correlation for limited time against how often a physician had time to research a topic on his own was r (27) = -.186 where p=.354 which is greater than p = .05. The correlation for difficulty accessing information against how often a physician had time to research a topic on his own was r (27) = -.412 where p=.033 which is less than p = .05. The correlation for availability of resources against how often a physician had time to research a topic on his own was r (26) = -.693 where p=.000 which is less than p = .01.

Correlations:

The figures below compare physician responses when asked to rate (on a scale of 1-6) three different barriers when keeping up-to-date with new medical information and how often they have time to research a topic on their own.

Correlations

		Time to Research a Topic	Limited Time
Time to Research a Topic	Pearson Correlation	1	-.186
	Sig. (2-tailed)		.354
	N	27	27
Limited Time	Pearson Correlation	-.186	1
	Sig. (2-tailed)	.354	
	N	27	27

Correlations

		Time to Research a Topic	Difficulty Accessing Information
	Pearson Correlation	1	-.412(*)
	Sig. (2-tailed)		.033

	N	27	27
Difficulty Accessing Information	Pearson Correlation	-.412(*)	1
	Sig. (2-tailed)	.033	
	N	27	27

* Correlation is significant at the 0.05 level (2-tailed).

Correlations

		Availability of Resources	Time to Research a Topic
Availability of Resources	Pearson Correlation	1	-.693(**)
	Sig. (2-tailed)		.000
	N	26	26
Time to Research a Topic	Pearson Correlation	-.693(**)	1
	Sig. (2-tailed)	.000	
	N	26	27

** Correlation is significant at the 0.01 level (2-tailed).

The variables of how informed a physician feels about prediabetes rated on a scale of one through six: one representing not informed about prediabetes and six being very informed about prediabetes was correlated against how comfortable a physician feels on diagnosing a patient with prediabetes which was rated on a scale of one through six: one representing not comfortable and six representing very comfortable. The two had a strong correlation, and therefore lead to a combined variable of being informed and comfortable in diagnosing a patient with prediabetes. The correlation was r (27) = .858, where p=.000 which is less than p =.01 showing the results to be significant and allowing a combination of these two variables.

Correlations:

The figure below compares physician responses when asked to rate (on a scale of 1-6) how informed they feel about prediabetes and their comfort in diagnosing prediabetes.

Descriptive Statistics

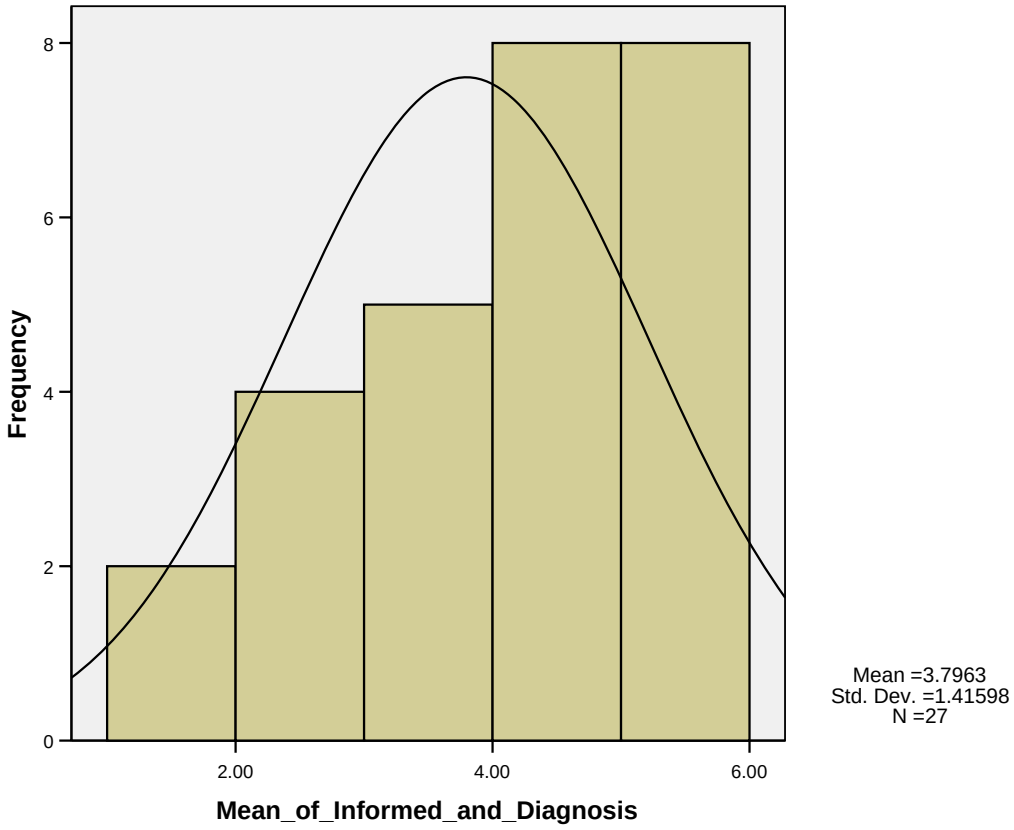
	Mean	Std. Deviation	N
Feel Informed about Prediabetes	3.5926	1.39392	27
Comfort in Diagnosing Prediabetes	4.0000	1.54422	27

Correlations

		Feel Informed about Prediabetes	Comfort in Diagnosing Prediabetes
Feel Informed about Prediabetes	Pearson Correlation	1	.858(**)
	Sig. (2-tailed)		.000
	N	27	27
Comfort in Diagnosing Prediabetes	Pearson Correlation	.858(**)	1
	Sig. (2-tailed)	.000	
	N	27	27

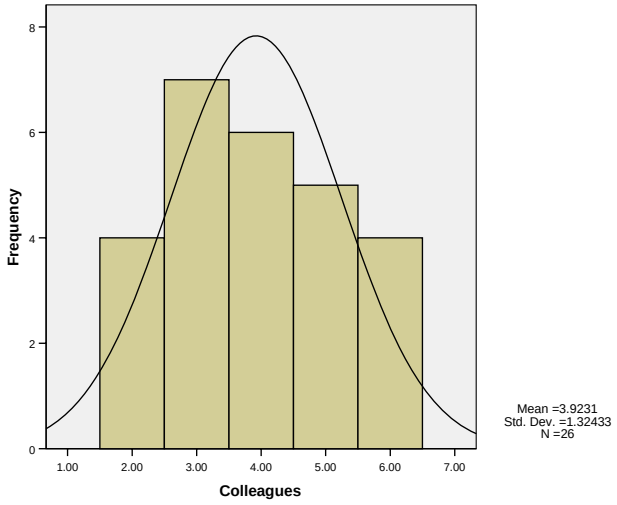
** Correlation is significant at the 0.01 level (2-tailed).

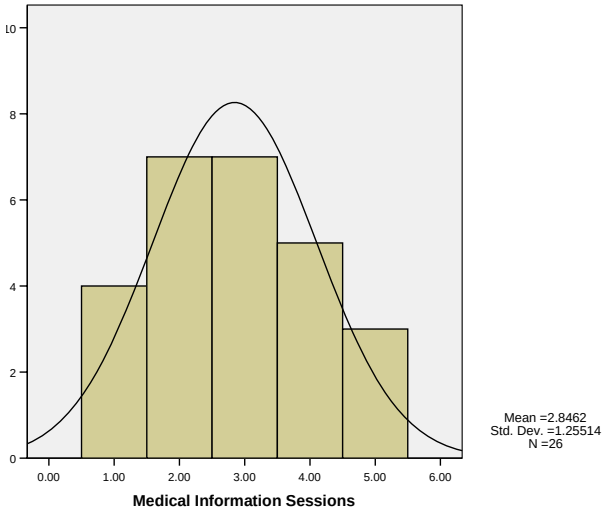
The combined variable representing how informed a physician felt informed about prediabetes rated on a scale of one through six: one representing not informed about prediabetes and six being very informed about prediabetes and how comfortable a physician felt in diagnosing a patient with prediabetes on a scale of one through six: one being not comfortable and six being very comfortable, produced the following histogram. The normal curve is plotted on the histogram to display how the results are not normally distributed.

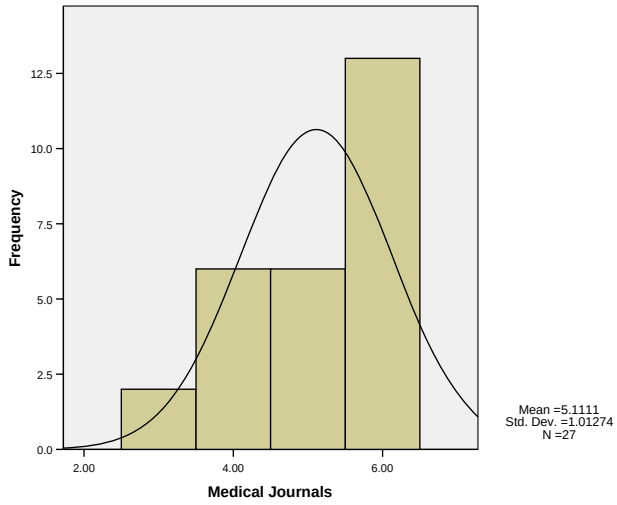


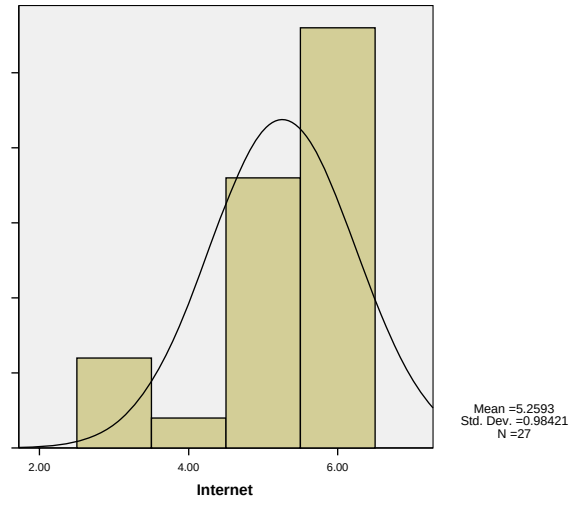
Five communication media (colleagues, medical information sessions, medical journals, internet, and mass media) produced the five histograms below. Each of these variables was assessed on how often a physician used the medium when trying to get more information about a new medial topic. The communication variables were on a scale of one through six: one being never use the medium as a source for new medical information and six being very often use the medium as a source for new medical information. The higher the mean, the more often the physician uses the source when trying to find more information about a new medical topic. The internet had a mean of five, showing that it was identified as the number one of these communication media that physicians used when trying to find out more about a new medical topic. Mass media

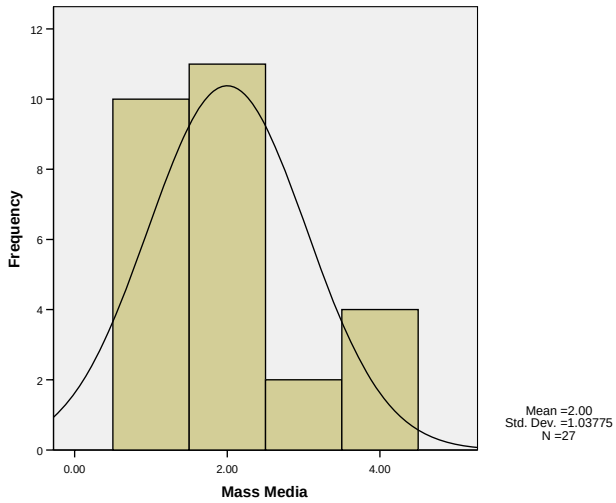
had a mean of 2, identifying it as the communication medium least likely used when trying to find out more about a new medical topic.











The number of trainings that physician attended on diabetes was correlated to the combined variable of how informed a physician felt about prediabetes and how comfortable a physician felt on diagnosing prediabetes. The results of the correlation show that there was a significant finding r (25) = .433, where p=.031 which is less than p =.05. The more diabetes training that a physician attended, the more informed and comfortable in diagnosing they felt with prediabetes.

Correlations:

The figure below compares physician responses when asked how many diabetes training they have attended against a new variable that was created that combines both informed about prediabetes and comfort in diagnosing prediabetes.

Descriptive Statistics

	Mean	Std. Deviation	N
Mean of Informed and Comfort in Diagnosis	3.7963	1.41598	27
Diabetes Training	4.0769	3.26096	26

Correlations

		Mean of Informed and Comfort in Diagnosis	Diabetes Training
Mean of Informed and Comfort in Diagnosis	Pearson Correlation	1	.433(*)
	Sig. (2-tailed)		.031
	N	27	25
Diabetes Training	Pearson Correlation	.433(*)	1
	Sig. (2-tailed)	.031	
	N	25	26

* Correlation is significant at the 0.05 level (2-tailed).

The variables of how often a physician has discussed prediabetes with a colleague in the last six months were rated on a scale of one through six: one representing never and six representing very often. The variable of how often a physician has read about prediabetes in the last six months was rated on a scale of one through six: one representing never and six representing very often. The two had a strong correlation, and therefore lead to a combined variable of discussing and reading about prediabetes. The correlation was r (27) = .528, where p=.002 which is less than p =.01 showing the results to be significant and allowing a combination of these two variables.

Correlations:

The figure below compares physician responses when asked about how often they discuss prediabetes with a colleague (on a scale of 1-6) and how often they have read about prediabetes in the last six months (on a scale of 1-6).

Descriptive Statistics

	Mean	Std. Deviation	N
Discussed Prediabetes with Colleagues	2.7037	1.29540	27
Read about Prediabetes	2.7778	1.25064	27

Correlations

		Discussed Prediabetes with Colleagues	Read about Prediabetes
Discussed Prediabetes with Colleagues	Pearson Correlation	1	.528(**)
	Sig. (1-tailed)		.002
	N	27	27
Read about Prediabetes	Pearson Correlation	.528(**)	1
	Sig. (1-tailed)	.002	
	N	27	27

** Correlation is significant at the 0.01 level (1-tailed).

This new combination variable of discussed prediabetes with colleagues and read about prediabetes was correlated to the combined variable of how informed a physician felt about prediabetes and how comfortable a physician felt on diagnosing prediabetes. The results of the correlation show that there was a significant finding r (27) = .685, where p=.000 which is less than p =.01. The more a physician read and discussed prediabetes the more informed and more comfortable they felt in diagnosing prediabetes.

Correlations:

The figure below compares physician responses when asked how informed and comfortable in diagnosing prediabetes against a new variable that was created that combines both discussed and read about prediabetes within the last six months.

Correlations

		Combined Read and Discussed Variable	Mean of Informed and Comfort in Diagnosis
Combined Read and Discussed Variable	Pearson Correlation	1	.685(**)
	Sig. (2-tailed)		.000
	N	27	27
Mean of Informed and Comfort in Diagnosis	Pearson Correlation	.685(**)	1
	Sig. (2-tailed)	.000	
	N	27	27

** Correlation is significant at the 0.01 level (2-tailed).

The physician was asked to name the medical journals that they read on a monthly basis. A variable was created that calculated the number of medical journals that the physician stated. This variable was then correlated to the mean of informed and comfort in diagnosing prediabetes. There was no significant finding r (27) = .094, where p =.641 which is greater than p=.05.

Correlations:

The figure below compares physician responses when asked how informed and comfortable in diagnosing prediabetes against how many medical journals they read on a monthly basis.

Correlations

		Mean of Informed and Comfort in Diagnosis	Number of Medical Journals
Mean of Informed and Comfort in Diagnosis	Pearson Correlation	1	.094
	Sig. (2-tailed)		.641
	N	27	27
Number of Medical Journals	Pearson Correlation	.094	1
	Sig. (2-tailed)	.641	
	N	27	29

A t-test was performed comparing the physicians that stated whether or not prediabetes was a topic that was covered in medical school. This was compared to the combined variable of whether a physician felt informed and comfortable in diagnosing prediabetes. The results were not significant. The Levene's test had a result of .487, meaning that the equal variances amongst the group are assumed. The t-test displays a not significant value of p= .650 which is greater than p=.05. This shows that there is not a statistical significance between these two variables. The physicians that had

prediabetes as a topic covered in medical school were slightly less informed and comfortable in diagnosing prediabetes.

Independent Sample t-Test

The difference between whether prediabetes was a topic that was covered in a physician's medical school and the combination variable of how informed and comfortable diagnosing prediabetes.

Group Statistics

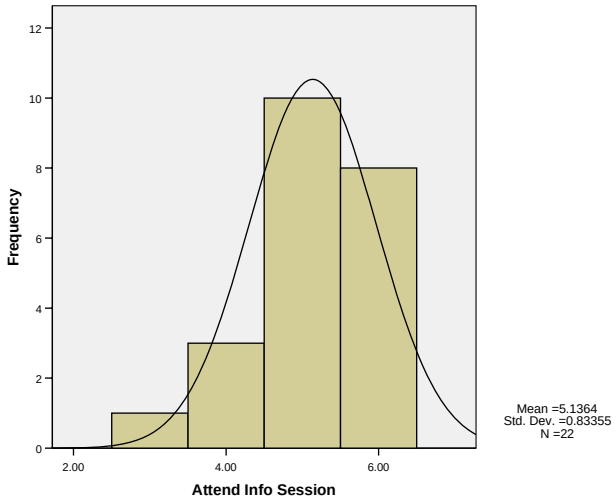
	Prediabetes Topic in Med School	N	Mean	Std. Deviation	Std. Error Mean
Mean of Informed and Comfort in Diagnosis	Yes	8	3.6875	1.55695	.55047
	No	15	3.9667	1.28823	.33262

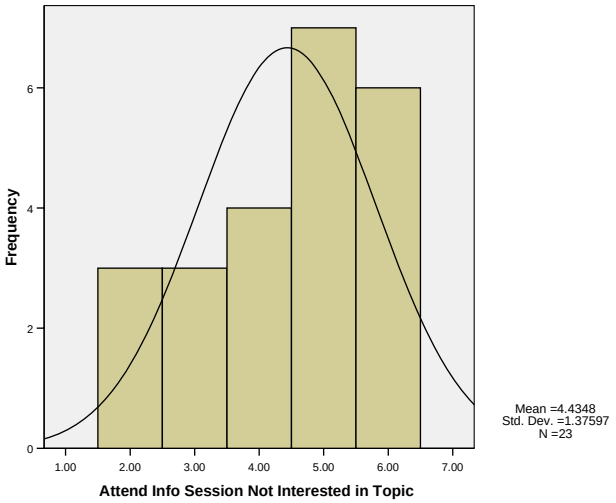
Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff	Std. Error Diff	95% Confidence Interval of the Difference	
									Lower	Upper
Mean of Informed and Comfort in Diagnosis	Equal variances assumed	.50	.487	-.5	21	.650	-.27917	.60574	-1.5389	.98054
	Equal variances not assumed			-.4	12.23	.672	-.27917	.64315	-1.6776	1.11924

Both the likelihood that a physician would attend an information session ran by their admired physician and the likelihood that a physician would attend and information session ran by their admired physician even if they weren't interested in the topic produced the following histogram. Each variable was rated on a scale of one through six:

one representing not likely to attend and six being very likely to attend. The normal curve is plotted on the histogram to display how the results are not normally distributed. The results of the histogram show that the results are skewed.





Discussion

This study suggests confirmation of the three hypotheses. First, physicians are less likely to spend time researching a topic when a barrier is present, even if they perceive ease in accessing medical information. Second, physicians that use more information sources perceive that they are more informed about prediabetes. The internet was identified as the most effective communication medium used when researching medical information. Third, physicians are more likely to attend an information session run by a physician they admire regardless of the topic itself.

Qualitative Study

The qualitative study allowed for comparison between the responses of the person in charge of medical education at each facility and the physicians that practiced within the facility. When comparing the responses, several discrepancies between the answers could be identified.

Response comparison at the hospital with medical school attached. There were some differences in how the medical education respondent at the hospital and the physicians at the hospital responded to the same questions. Because the medical education respondent is in charge of medical education for the entire hospital, they may have a different perception of the severity of and impact of medical conditions. For example, the medical education respondent stated that heart disease is the most common and serious medical condition that impacts the health of the minority community in which the facility is located; however, the physicians identified diabetes as the most common and serious medical condition. Heart disease was tied for second with obesity.

The internal medicine physicians have to deal with diabetes on a daily basis with the types of patients that they see, so therefore to them diabetes is more common and serious.

The medical education respondent stated that participation was mandatory for continuing education programs, but more than 50% of physicians stated that it was not mandatory. This displays that there is some miscommunication on either the side of the medical education respondent or the physician; the medical education respondent may not be emphasizing how mandatory these programs are, or the physicians do not understand that they are in fact mandatory. However, if medical education within the facility was mandatory, this could be an additional source that a physician uses in gaining knowledge. With this additional source, hypothesis two could be applied – adding an additional resource could also raise awareness.

The medical education respondent also stated that the physicians mostly stay up-to-date by attending medical information sessions. However, the physicians rated medical journals as their number one source for new medical information. The internet came in at a close second. The next source is their colleagues and medical information sessions are fourth.

The medical education respondent stated that their facility has had four training specifically on prediabetes, and there was "excellent turnout" at these trainings. However, seven of the physicians stated that they have attended zero prediabetes trainings, six physicians stated that they have attended one session, six physicians stated that they attended two sessions, and three physicians attended three or more sessions. Therefore, the response of the medical education respondent can be displaying a socially desirability

effect because it is socially desirable for the facility to have a significant number of trainings and for there to be “excellent turnout”.

This analysis suggests that communication between the medical education respondent and the physicians at the hospital may be not successful. With support of hypothesis one and two found in the quantitative research, the following could be some recommendations for more diffusion of prediabetes information. If a healthcare facility was able to identify the same serious and common medical condition as the physicians, then they may be able to allocate more resources to physicians on that topic. This would allow for more ease of accessing medical information as well as availability of resources and therefore raise the amount of time a physician would research a new medical topic on his own. In addition, if they made certain assessments or information sessions mandatory it would be another information source a physician could utilize and therefore raise their awareness of a new medical innovation. These are speculations that should be followed up with more research.

Response comparison at the community health center. The findings from the community health center produced some possible conclusions, however, the results were based on only one physician from the facility. The physician that responded was also a physician that the medical director noted as one of the most influential physicians within the facility, which can explain why many of the responses between the physician and the medical director matched. Although, the matching can also be indicative that since it is a smaller facility with a clinical doctor managing the physician education programs the needs of the physicians may be better known by the medical director than a medical education respondent in charge of the education of all types of specialties of physicians.

Further analysis of the communication between medical education respondents and the physicians within the facilities in which they serve should be conducted to make more conclusive claims.

Quantitative Research

Physicians do not find it difficult to access up-to-date medical information. Physicians also identified limited time as the number one barrier in gaining access to up-to-date medical information. However when correlations were performed on the three barriers (limited time, difficulty accessing information, availability of resources) against how informed a physician feels about prediabetes, there was no significant finding. Therefore, limited time may be a barrier for physicians when gaining up-to-date medical information in general, although it might not be a barrier for physicians when feeling informed about prediabetes. This information could also be displaying social desirability effect, because physicians may state that they feel informed about prediabetes, because that is the socially desirable response.

The three barriers were then correlated with how often a physician has had time to research a topic on his own time. Both difficulty accessing information and the availability of resources negatively correlated to how often a physician had time to research a topic on his own. Therefore showing, the more difficult it is to access information and the less available resources are, the less often a physician will research a topic on his own.

The first hypothesis was supported by the findings in this study. The first part of the hypothesis states that physicians do not have difficulty accessing information, which is proven by the mean of 2.26 out of 6, with one being easy to access information. The

second part of the hypothesis states that because of the extra effort of sifting through the information, the physician will not take the time to research a topic on his own. This was a finding of the correlation between the variable of a physician had time to research a topic on his own against the barriers of accessing information and availability of resources. The findings show that physicians do not spend as much time researching a topic on their own when either of those two barriers are an obstacle.

Ranking communication sources from the most often used to the least, the physicians ranked the internet as the most often used communication medium they would use when trying to get information about a new medical innovation. The next source was medical journals, then colleagues, medical information sessions, and last mass media. Further research should be conducted on this topic, for this information can be useful when education programs are being developed targeting the physician audience.

Physicians that attended more diabetes training programs were correlated to how informed and comfortable a physician felt in diagnosing prediabetes. In addition, the more that a physician discussed or read about prediabetes the more informed they felt in diagnosing prediabetes. However, the number of medical journals a physician read did not have any correlation to how informed and comfortable a physician is in diagnosing prediabetes. This is a different finding than the Coleman study, which found that the more medical journals a physician read, the more informed they are (1966). However, due to the increased use of technology, physicians may be using the internet more and using print media less. There are some findings in this study that could prove the second hypothesis true. The second hypothesis states that the more information sources a physician uses the more informed the physician will be, with the converse of the

statement also being true. Therefore, physicians that attended more trainings on diabetes felt more informed and comfortable in diagnosing prediabetes. In addition, physicians that discussed and read about prediabetes more are more informed and comfortable in diagnosing prediabetes. Physicians that rated feeling informed about prediabetes also rated that they are likely to diagnose a patient with prediabetes. Therefore feeling informed about prediabetes leads to the adoption of diagnosing patients with prediabetes.

Physicians were asked if they would attend an information session that a physician that they admired ran. On a scale of 1-6 (one being not likely and six representing very likely), the physicians had a mean of 5.14 on attending an information session that a physician that they admired ran. Physicians were also asked if they would attend an information session that physician that they admired ran even if they were not interested in the topic. On a scale of 1-6 (one being not likely and six representing very likely), the physicians had a mean of 4.34 on attending an information session that physician that they admired ran even if they were not interested in the topic. This result could prove the third hypothesis which states that influential members of a group can assist in the dissemination of new information. Physicians are more likely, than not likely, to attend an information session run by a physician that they admire whether they are interested in the topic or not. Therefore, if influential members are knowledgeable about a new medical innovation and held an information session, physicians are likely to attend.

The results of this study may have produced significant findings, but limitations of this study need to be acknowledged. There is small sample size, so the results can either be indicative of the population, or of just the sample itself. Non-respondent bias

could have occurred. Since an entire population of physicians were surveyed, there could be differences in the responses between those that volunteered to participate and those that chose not to participate. Therefore more research needs to be conducted in order to make more conclusive claims. In the rapidly evolving field of medicine, if time is the biggest barrier identified to new information, then continuing education of physicians needs to identify alternative methods of delivering quality information to physicians more quickly so they may better treat their patients. In addition, if physician education programs used several types of information sources, including the use of an influential physician within the physician community, the physicians may also perceive that they are more informed.

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Appendix A: Clinician Survey on Diabetes Care

July, 2006

This survey asks about your opinions and practices regarding Diabetes care. Your responses will help improve our understanding of clinical decision making. All responses will be kept strictly confidential.

Thank you for your participation. If you have further questions please feel free to contact us at 212-659-9551

Carol Horowitz, MD
Stephen Sigworth, MD

68-year-old Spanish speaking female with a history of osteoarthritis returns to you for a follow-up visit with complaints of worsening allergy symptoms. On exam her BP is 120/70 mmHg with a HR of 72 bpm. The remainder of her exam is normal. Her fasting labs, on two occasions, reveal glucoses of [96 and 99], [102 and 108], or [126 and 135] (Note- will rotate scenarios so 1/3 of doctors will get each of the 3 glucose levels). Other significant lab findings are normal renal function with no evidence of urinary protein.

A) Would you label this patient

- ❑ Normoglycemic
- ❑ Impaired Fasting Glucose/Pre-Diabetes
- ❑ Diabetes Mellitus
- ❑ Need more information to determine (**Please specify):** _____

B) What will you do at this time? (**Check all that apply.**)

- ❑ make no changes and continue routine screening
- ❑ check additional blood tests (**Please specify):** _____
- ❑ counsel patient (**Please specify what):** _____
- ❑ start a new medication (**Please specify which medication):** _____
- ❑ refer to another provider/service (**Please specify):** _____
- ❑ other (**Please specify):** _____

C) Up to what glucose level would you consider normal?
Fasting:_____
Post-Prandial:_____

D) At what level would you diagnose diabetes?
Fasting: _____
Post-Prandial:_____

E) What are the consequences of pre-diabetes (impaired fasting glucose or impaired glucose tolerance), independent of diabetes? **(Check all that apply.)**

- ❑ increased mortality
- ❑ increased cardiovascular disease
- ❑ increased progression to diabetes

F) What has been proven to prevent or delay diabetes? **(Check all that apply.)**

- ❑ weight loss
- ❑ medication
- ❑ nothing

Please provide us with the following information about yourself.

1. What is your gender? ❑ Female ❑ Male

2. In what year were you born? _____

3. In what year did you begin your medical practice? _____
(Beginning with your internship and residency.)

4. What is your medical specialty? (**Check all that apply**.)

   - ❑ Family Practice
   - ❑ Geriatric Medicine
   - ❑ Internal Medicine
   - ❑ Advanced Nursing
   - ❑ Other (**Please specify):** _____

5. What is your ethnicity/race? (**Check all that apply.**)

   - ❑ White, Non-Hispanic
   - ❑ African American/Black
   - ❑ Hispanic/Latino
   - ❑ Asian/Pacific Islander
   - ❑ Other (**Please specify**): _____

6. If a Spanish-speaking patient with limited English skills comes to your office, how do you communicate with this patient?

   - ❑ I am fluent in Spanish.
   - ❑ I speak enough Spanish to communicate.
   - ❑ Spanish-speaking office staff provides translation.
   - ❑ I arrange for a telephone translator.
   - ❑ The patient provides a translator.

7. In a typical week, what percentage of time do you spend on each of the following activities:

   In the clinic or office seeing patients ____%
   In the hospital making rounds, in the emergency room, or on other hospital duties ____%
   In administrative duties and other professional activities not involving patient care ____%
   In academic duties, such as teaching, student supervision, and research ____%

8. How comfortable are you in teaching patients about diet, healthy eating, and exercise? (**Please circle)**

   Not Comfortable 1 2 3 4 5 Comfortable

9. In your practice, what barriers exist from providing lifestyle modifications? (**Check all that apply**.)

   - ❑ Time
   - ❑ Access to specialty physicians
   - ❑ Access to nutritionist
   - ❑ Relating to different racial/ethnic backgrounds of patients
   - ❑ Other (**Please specify):** _____

Thank you very much for your help!

Appendix B: Interview Questions

Interview/Telephone Script

(After the brief verbal introduction for the qualitative survey is read. The participant will hopefully agree to either meet with the interviewer in person, or engage in a telephone conversation. The following questions will be asked)

1. In your opinion, which of the following is the most common and serious medical condition that impacts the health of the community in which your facility is located? Heart Disease, Asthma, Obesity, Cancer, Diabetes, or Other? (Please Rank)

2. Does your medical facility provide continuing education programs for physicians on sight?

3. Is the participation for these programs mandatory?
    a. If yes, do most of the physicians attend?
    b. If no,
        i. Is there a requirement to attend specific ones?
        ii. Or a certain number of trainings?
        iii. Or even though it is not mandatory, do many physicians attend?

4. Which medical journals do you have available to the clinicians that work in your facility?

5. Do you feel that your physicians are up-to-date with all new medical changes? -- Probe (how do you know? Or why do you think so?)

6. How do you make sure that your physicians are up-to-date with all new medical changes?

(This question is only to be asked if the facility has onsite training available to its physicians)

7. Has your facility had any trainings on prediabetes?
    a. If yes, how many? Was there good attendance?
    b. If no, is there one scheduled in the near future?

8. Can you name a couple of physicians that you feel are most current with new medical information regarding prediabetes?

9. Can you name a couple of physicians that you feel have a strong influence over other physicians in your facility?
    a. Do you feel these physicians are well informed about prediabetes?

Appendix C: Transcripts of Interviews

Transcript from hospital with medical school attached: person in charge of medical education

Experimenter: In your opinion, which of the following is the most common and serious medical condition that impacts the health of the community in which your facility is located? Heart Disease, Asthma, Obesity, Cancer, Diabetes, or Other? (Please Rank)

Respondent: Hmm, I know that the number one is heart disease, but what do we focus on, I would have to say heart disease.

E: Does your medical facility provide continuing education programs for physicians on sight?

R: Yes

E: Is the participation for these programs mandatory? Do most of the physicians attend?

R: Yes

E: Which medical journals do you have available to the clinicians that work in your facility?

R: Oh my god, all of them.

E: Do you feel that your physicians are up-to-date with all new medical changes?

R: Everybody could use improvement.

E: How would you say that they keep themselves up-to-date, do you believe it is mostly through your office?

R: No. They attend national meetings, region programs, grand rounds

E: How do you make sure that your physicians are up-to-date with all new medical changes?

R: Well CME is mandatory. So they must attend so many hours, and half of those hours half to be at an onsite program.

E: Has your facility had any trainings on prediabetes? How many?

R: Yes. We maintain a website, and have had four or five programs. Do you mean in the course of our existence?

E: No, within the last year or so.

R: Ok, let's say four.
E: And did you find that there was a good turnout?

R: Yes. Excellent turnout.

E: Can you name a couple of physicians that you feel are most current with new medical information regarding prediabetes?

R: [Stated three physicians]

E: Can you name a couple of physicians that you feel have a strong influence over other physicians in your facility?

R: [Stated four physicians], the list goes on and on.

E: Do you feel these physicians are well informed about prediabetes?

R: Well, these physicians aren't just diabetic physicians. But they are the leaders. The three that I mentioned are leaders in their field.

Transcript from community health center: medical director

Experimenter: In your opinion, which of the following is the most common and serious medical condition that impacts the health of the community in which your facility is located? Heart Disease, Asthma, Obesity, Cancer, Diabetes, or Other? (Please Rank)

Respondent: I only get one? Hmm…obesity and asthma are neck and neck.

E: Does your medical facility provide continuing education programs for physicians on sight?

R: Yes.

E: Is the participation for these programs mandatory? Do most of the physicians attend?

R: Not mandatory no, we have courses internally that are operational. Um blood borne pathogens, HIPA standards, programs like that are mandatory, but most of our physicians attend all the trainings. We have a monthly lecture series.

E: Which medical journals do you have available to the clinicians that work in your facility?

R: We don't have specific journals, but we have access to anything we like through the (State) Academy of Medicine. We have a relationship with them. So we have any articles or information that we need. We have a librarian onsite though that gets them for us.

E: Do you feel that your physicians are up-to-date with all new medical changes?

R: As up-to-date as they can be, yes.

E: How would you say that they keep themselves up-to-date, do you believe it is mostly through your office?

R: Because at clinical meetings we sit and discuss changes and standards in healthcare delivery in different areas. So as much as any one physician can keep up to date. Things are changing constantly, so it's hard to say I know what changed last week necessarily, however they do a good job by attending conferences, sitting around the table and discussing standards, reviewing cases, and the questions that get exchanged back and forth between the different providers.

E: How do you make sure that your physicians are up-to-date with all new medical changes?

R: Well we give them a week of continuing medical education outside of the organization. And our monthly clinical meetings we sit and discuss what are their

desires of learning, and we bring in speakers, or I provide lectures, or have people prepare lectures to meet their needs and their requests. We also um, I get a daily email called "Physician's Watch" which gives you the recent blurbs that hit the media or new research that has been released, often things in the New England Journal, often things we are hearing on the news, but it has the in-depth article connected with that topic. And I make sure to forward them the letter that is timely and appropriate for them. And I do get feedback, so I know that they are reading them and discussing them.

E: Has your facility had any trainings on prediabetes?

R: Specifically no.

E: Are there any scheduled for the near future?

R: Um…we are doing, we are involved with a National Collaborative on Diabetes Management, and the concept of prediabetes is accepted variably in the clinical community. I think that people recognize that there is a situation, but I don't know if the patients are specifically labeled that. But, we do deal and focusing in 2007 on obesity in our pediatric population and diabetes management in our organization. So it does come up, but not specific prediabetes education.

E: Can you name a couple of physicians that you feel are most current with new medical information regarding prediabetes?

R: [Stated two physicians, one of which took the clinician survey on medical information sources]

E: Can you name a couple of physicians that you feel have a strong influence over other physicians in your facility?

R: [Stated two physicians, one of which took the clinician survey on medical information sources]

E: Do you feel these physicians are well informed about prediabetes?

R: Yes.

Appendix D: Clinician Survey on Medical Information Sources

Clinician Survey of Medical Information Sources

January, 2006

Time is a factor when keeping up-to-date with new medical information; this survey aims to target this problem and make medical information more readily accessible.

This survey asks about your opinions and practices regarding information gathering on new medical innovations. Your responses will help improve our understanding of clinical information gathering.

All responses will be kept strictly confidential. The questions asking about names of specific individuals are only being used for identifying social groups; your response will remain confidential. The attached survey will only take 5-10 minutes of your valuable time.

Thank you for your participation. If you have further questions please feel free to contact me at 908-612-5452

Stephanie Zefferino
Cornell University

Clinician Survey of Medical Information Sources

The following questions ask your opinion about the significance of diseases and your access to medical information.

1. In your opinion, please evaluate the following medical conditions on how their prevalence impacts the health of the community in which you serve?

Heart Disease	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**
Diabetes	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**
Obesity	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**
Asthma	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**
Cancer	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**
Other **(Please specify)**_____	**No Impact**	**1**	**2**	**3**	**4**	**5**	**6**	**High Impact**

2. In the past year, approximately how many trainings (i.e. lectures, courses, conferences, etc.) have you attended on the following topics?

Heart Disease _____

Diabetes _____

Obesity _____

Asthma _____

Cancer _____

Other **(Please Specify)** _____

3. What are the biggest barriers to getting updated medical information? (**Check all that apply)**

Limited Time	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Difficulty Accessing Information	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Availability of Resources	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Other (**Please specify)**_____	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**

4. If you wanted to get more information about a new medical topic where would you go?

Colleagues	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Medical Information Sessions	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Medical Journals	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Internet	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Mass Media (i.e. newspaper, television news, radio news, etc.)	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
Other (**Please specify)**_____	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**

5. Which medical journals (if any) do you read on a monthly basis?

   1.)_____

   2.)_____

   3.)_____

6. In your opinion, how easy do you find it to access updated medical information?	**Easy**	**1**	**2**	**3**	**4**	**5**	**6**	**Difficult**
7. In the past six months, how often have you had time to research a topic on your own?	**Not Often**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**

8. Does the medical facility in which you practice provide continuing education?	**Yes**	**No**	**Not Sure**

8a. If you answered "Yes" to Question 8, please rate the quality of the programs.	**Poor**	**1**	**2**	**3**	**4**	**5**	**6**	**Excellent**

8b. If you answered "Yes" to Question 8, is participation mandatory?	**Yes**	**No**	**Not Sure**
9. Was prediabetes a topic covered in the medical school you attended?	**Yes**	**No**	**Not Sure**
10. How many information sessions have you attended on prediabetes?			_____

11. About how often have you discussed prediabetes with your colleagues in the last six months?	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
12. About how often have you read about prediabetes information in the last six months?	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**
13. Do you feel that you are informed about prediabetes?	**Not Informed**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Informed**
14. In your opinion, how comfortable are you with diagnosing prediabetes?	**Not Comfortable**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Comfortable**
15. In your experience, have your prediabetic patients been willing to alter their lifestyle to reverse their prediabetes?	**Never**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Often**

The following questions ask names of individuals, your answers will only be used to identify social clusters and that your responses will remain confidential.

16. Please list two physicians that you work with that you admire and rate their knowledge of prediabetes.

1.)_____	**Not Knowledgeable**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Knowledgeable**
2.)_____	**Not Knowledgeable**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Knowledgeable**

17. How likely are you to attend an information session that they ran?	**Not Likely**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Likely**
18. How likely would you be to attend, even if you were not interested in the topic?	**Not Likely**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Likely**

19. Please list up to six physicians that you regularly interact with and rate their knowledge of prediabetes.

1.)_____	**Not Knowledgeable**	**1**	**2**	**3**	**4**	**5**	**6**	**Very Knowledgeable**

2.)_____**Not Knowledgeable 1 2 3 4 5 6 Very Knowledgeable**

3.)_____**Not Knowledgeable 1 2 3 4 5 6 Very Knowledgeable**

4.)_____**Not Knowledgeable 1 2 3 4 5 6 Very Knowledgeable**

5.)_____**Not Knowledgeable 1 2 3 4 5 6 Very Knowledgeable**

6.)_____**Not Knowledgeable 1 2 3 4 5 6 Very Knowledgeable**

Please provide us with the following information about yourself.

1. What is your gender? **Female** **Male**

2. In what year were you born? _____

3. In what year did you begin your medical practice? (Beginning with your internship and residency) _____

4. What is your medical specialty? **(Check all that apply)**

- ❑ Family Practice
- ❑ Advanced Nursing
- ❑ Geriatric Medicine
- ❑ Other (**Please specify)** _____
- ❑ Internal Medicine

5. What is your ethnicity/race? **(Check all that apply.)**

- ❑ White, Non-Hispanic
- ❑ Asian/Pacific Islander
- ❑ African American/Black
- ❑ Other **(Please specify)** _____
- ❑ Hispanic/Latino

Thank you for taking the time to complete this survey!

Variation of Question for Hospital

The following questions ask names of individuals, your answers will only be used to identify social clusters and that your responses will remain confidential. The individual that you name will not be contacted.

16. Please list two physicians that you work with that you admire and rate their awareness of prediabetes.

1.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

2.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

17. How likely are you to attend an information session that they ran? **Not Likely 1 2 3 4 5 6 Very Likely**

18. How likely would you be to attend, even if you were not interested in the topic? **Not Likely 1 2 3 4 5 6 Very Likely**

19. Please list up to six physicians that you regularly interact with and rate their awareness of prediabetes.

1.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

2.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

3.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

4.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

5.)_____ **Unaware 1 2 3 4 5 6 Very Aware**

6.)_____ **Unaware 1 2 3 4 5 6 Very Aware**