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Rising Costs of Insulin and Effects of Self-Management in Type 1 Diabetes

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NURS 4500: Nursing Research and Senior Thesis

Dr. Patricia Harris

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II. **ABSTRACT**

Type 1 diabetes, also known as juvenile diabetes or insulin-dependent diabetes is a chronic condition where the pancreas may not be able to produce little to no insulin. This type of diabetes can be attributed to some factors such as age, family history, environmental factors, or types of viruses. It is seen more often in childhood or adolescence but can develop in adults, averaging approximately 5-10% of the population.

Insulin is a type of hormone produced in the pancreas naturally or can be manufactured in the laboratory. People with Type 1 Diabetes need insulin from an exogenous source to survive. Due to the increased need for insulin and the ability to mass-produce multiple types of insulin, there is a rising cost in the United States. Since pharmaceutical manufacturers do not have price limitations or direct competition in the insulin market, they can price their products at any desired level. In the equivalent, diabetes medication costs have increased following the insulin influx demand.

Objective

This thesis will explore ways to reach, educate the population and provide cost-effective insulin and medications for diabetics. Establishing accessibility would aid in an increase of safety and self-management of the disease process and possibly decrease the rates of deaths associated with diabetes.

Summary of Findings-

Through a review of different research types, there were common trends regarding the major inflation of insulin costs to the difficulty of accessibility of goods. The difficulty of accessibility can also be attributed to poor health literacy, communication, or if there were disagreements with the healthcare

goals of the patient. In addition, the underlying strength of all these studies was the participation of varied ages, genders, races, and socioeconomic standing.

Proposal

We want to examine the impact of the rising costs of insulin on patients' ability to manage their Type 1 diabetes, specifically looking at the effects it has on lower socioeconomic regions.

III. **ACKNOWLEDGEMENT**

I dedicate this thesis to my number one supporters, my family: Jenife, Jesus, Cassandra, Kyle Yadao, and Erlinda, Julian Villanueva. Thank you for supporting me throughout my entire educational journey and beyond.

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V. **INTRODUCTION**

Introduction

Rising costs of insulin and medications have affected the self-management of diabetics that cannot afford or lack the supplies necessary to maintain care. According to WHO, most individuals living with diabetes come from lower to middle-class countries with an estimate of "1 in 2 people worldwide cannot get access to insulin they need".(Improving, 2021). Alternatively, due to this disparity, a goal is to find ways to reach and educate the population and provide cost-effective insulin and medications for diabetics. Establishing accessibility would aid in an increase of safety and self-management of the disease process and possibly decrease the rates of deaths associated with diabetes.

Diabetes is a chronic health condition that can be characterized by an elevation of blood glucose levels due to the body being unable to produce or make use of the hormone insulin. There are three types of diabetes: Type 1, Type 2, and Gestational Diabetes. The focus will be on Type 1 diabetes, which is also known as juvenile diabetes or insulin-dependent diabetes as it is a "chronic condition in which the pancreas produces little to no insulin" and may be attributed to some factors such as age, and family history, environmental factors, and viruses (Mayo, 2021). Type 1 is seen more often in childhood or adolescence but can develop in adults, with "approximately 5-10%" of the population having type 1 diabetes. (Centers, 2021). A1C is a blood test that averages blood glucose levels over a course of two to three months and is one of many tests which can determine if an individual is diabetic, considering other health factors and age. If an A1C level is over "6.5 percent", for more than one test, this is an indicator of diabetes. (Mayo, 2021) Any additional tests that can be done to determine diabetes are a random blood sugar test (blood glucose levels over 200 mg/dL indicate diabetes) or a fasting blood sugar test (126 mg/dL or over indicates diabetes).

Insulin is a life-saving hormone produced in the pancreas naturally but can also be manufactured in a laboratory and comes in different types: rapid-acting insulin, regular or short-acting insulin, intermediate-acting insulin, long-acting insulin, and ultra long-acting insulin. People with Type 1 Diabetes need insulin from an exogenous source to survive. With the multiple types of insulins, there is a rising cost in the United States that can be reasoned due to "pharmaceutical manufacturers to price drug products at the desired level" without any limitations and "direct competition in the insulin market". (Julian, 2021). In the equivalent, medication costs have increased following the influx of insulin demand.

The research question to be examined in this thesis is:

What is the impact of the rising cost of insulin on a patient's ability to manage their Type 1 Diabetes?

VI. **LITERATURE REVIEW**

This thesis will explore ways to reach, educate the population and provide cost-effective insulin and medications for diabetics. Establishing accessibility would aid in an increase of safety and self-management of the disease process and possibly decrease the rates of deaths associated with diabetes. Primary research sources for the articles used in this study were found on The Dominican Iceberg and PubMed. Key search terms used to find these articles included type 1 diabetes, rising costs of insulin, self-management, socioeconomic disparities, and accessibility.

The articles were chosen based on their sample size, population interviewed, methods used, and purpose or objective of the study. Taking into consideration these factors, seven sources were used to complete this literature review. The articles are divided into three different sections focusing on the

following categories: Socioeconomic Disparities and Accessibility, Increase Costs of Diabetes Care, and

Self-Management of Disease

Socioeconomic Disparities and Accessibility

The first category addresses the disparities on the basis of socioeconomic status and geographical

areas. Socioeconomic status addresses the standing or class of a singular being or group measured on the

basis of their income, occupation, education, or culmination of the three. In relation, according to the

American Psychological Association, there is an intertwined relationship with SES, race, and ethnicity in

the way "communities are often segregated" due to these factors. (American, 2017). Pushing communities

with lower SES to more rural areas and higher to urban areas. These articles fall into discussing health

literacy, patient/doctor relationships, and participants' feelings toward the healthcare system based on the

accessibility.

Based on a national survey conducted from 2004 to 2006, the "prevalence of diabetes was 11.8%

among non-Hispanic blacks and 10.4% among Latinos/Hispanic Americans compared to 6.6% for non-

Hispanic whites" (Vest, B.et.al, 2013). Following semi-structured interviews with thirty-four participants

from West Side Buffalo, the objectives were to analyze the patients' understanding of their disease,

response to it, and how it is impacted by their social support (family, neighbors, and peers) and

institutional resources (physicians, healthcare support) coming from high-poverty urban settings. It was

found that the better and more support shown by those around them, resulted in more positive outcomes

for the patient. Having healthy relationships with their providers had correlations to better diabetes care

although, there were uncontrolled barriers of lack of health insurance or inadequate coverage of insurance.

Patients with unmet needs such as education, instrumental or facilitation, and lack of

empathy/understanding. They saw it to be detrimental to their self-management of the disease such as lack

of access to a nurse outside office hours. Refugees in the study experienced issues stemming outside of socioeconomic statuses such as limited understanding of the English language, education of the healthcare system, and preventive care for diabetes.

A qualitative descriptive study interviewed twenty-eight diabetic patients and six healthcare professionals about gaining access to intensive insulin regimens (IIRs) (Scott, A, et.al.,2019). Patients coming from lower socioeconomic statuses experienced barriers to access to services due to factors related to their work, and lifestyle, and having problems transporting themselves to hospital services. Navigation of hospital services was harder for some patients than others; the majority of patients who sought out information came from higher SES, related to possibly having higher health literacy or social support. Specifically in this study, professionals played a role in deciding who will be offered treatments; suggesting patients that who can facilitate access are preferable in comparison to those who could not.

A cross-sectional study was taken on a multicenter collection of patients compared, racial-ethnic and glycemic disparities outside of the patient's socioeconomic status. (Agarwal.S, et.al.,2020). Patients that fell underneath the categories of Non-Hispanic Black or Hispanic experienced lower diabetes technology in comparison to their Non-Hispanic White peers. Taking account of the patients' SES, it was discovered that diabetes technology use, distress of diabetes, and how self-management is done, accounted for the biggest glycemic disparity in the study

The first article identified unmet needs and the importance of social support, and relationships between patients and healthcare professionals/ healthcare system. The second article emphasizes the difference between high versus low socioeconomic classes and how they are approached differently based on their status. Their barriers to accessibility, primarily transportation, were what considered whether or not they would receive more diabetes care or treatments. The final article looked into inequities stemming from racial-ethnic backgrounds and figured out opportunities that can help clinicians close the disparities

by promoting diabetes technology and tailoring support case to case for each patient. All of the articles underneath this category open up new ways to decrease barriers

Increased Insulin Costs

There has been a rapid increase in the costs of insulin and diabetes medications in the past years. According to several research studies, prices have been inflated by hundreds to thousands of percent. This portion of the literature review will examine the implications of why there is a sudden increase in prices. It will also explore the estimated mean annual out-of-pocket costs and financial burden on the population.

The retrospective observational study observed the effects of controlling diabetes and outcomes based on client visits (Crossen, S, et. al, 2020). Diabetes care costs accounted for ambulatory care, the care given in the hospital, insulin, technology, and needed supplies for their diabetes. This additionally looked at mean costs and adjusted them in accordance with each patient during a four-year period. It was discovered that insulin was the predominant cost driver due to how exogenously used it is in T1D.

This quantitative study highlights the financial burden of out-of-pocket costs for diabetes care on a patient (Julian, K., et.al, 2021). This study in particular observed to what degree the burden financially has been placed due to the inflation of prices. It took into account, all out-of-pocket costs such as the deductible, copayment, and coinsurance for all the supplies and insulin. In just a 13-year period there was about a "54%" increase in the mean out-of-pocket costs for both insulin and diabetes-related supplies. (Julian, K., et.al, 2021)

Both of the articles emphasize the concept of the rising costs of insulin being attributed to the United States not capping insulin prices and allowing for pharmaceutical companies to price them at their desired level. Having the insulin trademarked and only sold by three predominant pharmaceutical companies has prevented the chances of lowering costs. This itself does not include the other equipment necessary to monitor one's diabetes, taken out-of-pocket. This research opens up a setting reality of a call

of action at the provider and legislative levels for finding what can be done to cap excessive pricing for life-sustaining medications that can be produced easily.

Self Management

This final category discusses ways to self-manage the disease in the way of how the patients go about their behavior towards the regimen and if they adhere to the plan. Self-management is referenced as an individual's behavior and activity towards controlling and treating their condition by doing glucose monitoring checks.

This mixed-method study conducted following the Behavior Change Wheel framework worked to identify the sustained behaviors between self-management and influences(Hamilton K, etc. al,2021). The Behavior Change Wheel in this study looks at the behaviors involved in self-management of T1D and the systemic review, red flags identified by healthcare providers red flags, and the participant-generated frequently asked questions.

The multivariate analysis examines the ethnic/racial disparities in self-management behaviors and if there were associations between behavior and blood glucose control Butler, A., etc. al, (2020). The study noted that Hispanics and African-Americans in comparison to non-Hispanic whites were less likely to check their blood glucose levels and miss mealtime boluses of insulin dosages. This can be attributed to minorities being less likely to utilize insulin pumps or do continuous glucose monitoring

The first article views the multiple behaviors that are among the three main self-management cycles (Routine, Reactive and Reflective) relating to T1D. Barriers discovered should be addressed and provided methods of support to improve outcomes. Concluding the second article, research moving forward should look into technology-based interventions and the ways diabetes technologies can be accessed for management. Research moving forward into how to provide behavioral interventions based on African American and Hispanic treatment adherence related to their social support. A start to this can

be an evaluation of contextual and social mechanisms that can cause low engagement of self-management by addressing the differences in races in glycemic outcomes.

Overall Review

To reemphasize, the three categories provided were socioeconomic disparities and accessibility, increased costs of diabetes care, and self-management of disease. There was an underlying similarity in all the findings addressing that healthcare providers can aid in decreasing barriers to access by working to provide equitable access despite the lack of convenience it may give them. In effect this implementation, it may aid in the motivation of communities with lower rates of self-management to go through with their insulin dosages and be more willing to adhere to the plan set by their healthcare providers.

Primary strengths seen in predominantly all studies are large sample sizes consisting of a diverse group of ages, races, genders, and regions that have T1D. Additional strengths are having both the perspectives of the patients and doctors as well as having studied with a focus on communities that are misrepresented. Limitations on the other hand are a misrepresentation of low socioeconomic status communities, non-English speakers, uninsured, data collected outside of ten years, limited medical centers, and self-reporting.

Due to self-reporting, there can be a misrepresentation of communities, especially smaller racial/ethnic communities such as Pacific Islanders or Native Americans. A big gap is not having enough data on uninsured patients and the effects of costs of insulin. If the data came from the past 10 years, which may not be completely relevant with the continuing increase in insulin costs

VII.   **PROPOSAL FOR FURTHER STUDY**

Questions that arise from my literature review is:

- How can we close the gap between the socioeconomic classes?

- How can we better serve underrepresented communities?

- Will education about the disparities and obstacles that patients experience help healthcare providers be more motivated to advocate for their patients?

Further research is clearly needed. Therefore, I am proposing a new study. The evidence uncovered in the Literature Review demonstrates that improvement in self-management of Type 1 Diabetes through education is sorely needed. Furthermore, expansion of access to healthcare resources, such as transportation to community clinics, and lowering of medication costs, primarily insulin, is essential. A study is proposed to explore means to improve healthcare accessibility and provide better health education for people with Type 1 Diabetes in an economically challenged and underrepresented community.

Theoretical Framework

The theoretical framework that will be used in this study follows the Framework for Prevention by Nancy Milio. Nancy Milio is a theorist certified in Public Health Policy and Administration in addition to being a Nursing Professor. This framework was inspired by her work during the 1960s when prompting her patients on the reasons why they did not wish to seek further medical advice after telling them to do so. In response to her question, there were common answers following things that they lacked or needed to be more willing to reach out for care such as transportation, money, and childcare. Upon obtaining this information, she began to figure out a way that could help these communities and eliminate such obstacles. Framework for Prevention in many ways works to redefine the way a healthcare provider can provide community care and discuss systemic issues at the same time. This framework highlights three categories: "education directed towards voluntary change in attitude and behavior of the subjects", engineering directed at managing risk-related variables" and "enforcement directed at mandatory

regulation to achieve better health". The goal of this framework is to observe the behavioral patterns of a population based on the habitual selection from limited choices due to a lack of knowledge

Primary Research Aim

The primary research aim of this thesis is to examine how culture, socioeconomic status, or inaccessibility influences life decisions made by patients. Another aim of the research is to discover what possibly caused the sudden rapid influx of insulin.

Population and Sample

The population to be studied is people in San Francisco who have been diagnosed with Type 1 Diabetes. The planned proposed sample size is at least 200 individuals. The plan of recruitment of participants is to get volunteers from specific regions with higher rates of Type 1 Diabetes. Recruitment will take place through local community clinics. The study could be interesting to participants when indicating all the information they can obtain through the study which can better health-related decisions.

Populations to take account of are those that are misrepresented due to these communities being smaller given their population in relation to the city. A prime example would be Native Americans or Pacific Islanders, who are a population that may tiny on average to other communities. Another population less vulnerable to consider is uninsured, non-English speaking communities.

Ethical Considerations

The protection that should be in place for the collection of data to be stored in accordance to upkeeping the patient's confidentiality is to have password-locked devices. In addition, any sort of personal identifiers will not be collected nor left on the study documents. Assuring a lock of the devices makes it harder for encryption or information to be stolen.

The consent process should follow the five elements of informed conset following the standards of the Joint Commission. Required elements of informed consent should be explained to the patient the entire

nature of the procedure, what are the risks or benefits of conducting the procedure, what alternatives can be done in the procedure, their benefits or risks, and establish that the patient understands these elements. An established understanding of what the patient is consenting to should be done by asking them to repeat back what they learned or understood. The participants' right to privacy is to be addressed before the study is initiated. Their rights as a participant are that they are allowed to refuse to be in the study or stop whenever they would like to during the study even if they have begun. Transparency of the entire study procedure is important. There will be interviews conducted for this study, which will be recorded. The rationale for recording will be explained, and the participant's signed consent for the recording will be needed and obtained separately prior to the start of the interview. A study ID will be assigned to each participant to protect their privacy. An Internal Review Board will be used to ensure the protection of human participants as the research should not go out of the scope of obtaining concerns of the populations and educating them on what ways they can be improved. This study will need to be approved by the internal review board. The study is anticipated to pose only a minimal risk to the participants.

Research Design

For this study, a mixed-method design will be used, including quantitative and qualitative elements. In addition, a longitudinal approach will be used to study factors that can affect patients' ongoing management of Type 1 Diabetes. First, for the quantitative approach, survey questions that can be coded for statistical analysis will be asked, such as demographics. Then, for the qualitative approach, an ethnography research design will focus on communities in the greater San Francisco Bay Area. Ethnography involves the descriptive study of human society (Augustyn, 2020). Ethnographical methods are to be implemented to observe and assess how the participants interact in their environment and manage their disease.

Research Methods

Recruitment of participants for this study will be initiated by taking into account the ethical

considerations and working alongside the clinics to provide the survey to the participants. Those involved

will participate voluntarily and the criteria to take into account are a diagnosis of Type 1 Diabetes, living

in a lower socioeconomic region (less than $42,000 a year), and must have a prescription for insulin

and/or diabetes medications for at least a year. Recruitment will continue on a rolling basis for two years.

PROCEDURE (PHASES)

For those who meet the inclusion criteria, the study will be conducted in two phases.

In the first phase, all of the participants will be initially asked questions about their demographics such as

their ethnicity, age, and race. This phase includes questions about their health history individually and if

there are any health conditions that run in their family. This is all necessary to establish a baseline and

control to compare with the results. Additionally, the first phase will provide a survey to the participant,

which will involve questions, such as:

➢ Where do you currently reside (county only)?

➢ Do you follow your medication insulin regimen?

➢ How often do you see your healthcare provider?

➢ Where their provider is located in distance (in miles) from your home?

➢ Do you have transportation to your appointments?

➢ Are you insured?

➢ What their average annual income (Choose the range: <$10,000; $11- 20,000; $21- 30,000;

$31- 41,000; >$42,000)?

These questions work to determine if any of these underlying factors influence their health

decisions as well as if the survey were to be conducted again, would anything change. Surveys would be

provided to facilities close to lower socioeconomic regions or heavily dense ethnic populations with

higher rates of Type 1 Diabetics.

The same survey will be distributed on a monthly basis over the course of three-month intervals

for a year. Starting from the first month, the researcher will get a baseline of their insulin/medication

usage and how often they see their healthcare provider. Moving in a cycle of every three months, the

researcher will conduct the survey again to see, if there are any improvements or changes in behavior

towards self-management.

The second phase of the study will involve two one-hour recorded interviews using a semi-

structured interview guide to take place in the participant's home or other location that is comfortable for

and familiar to the participant. The interviews will take place at the beginning of the study and at the end,

one year apart. Consent from participants for recording the interviews will need to be obtained. Open-

ended questions that focus on participants' concerns related to the disease process, possible treatments,

medications, and lifestyle changes that they feel have not been adequately addressed. In addition, the

research will ask the participants to share their perspectives on their education needs and how healthcare

providers can best serve their overall needs.

Data Analysis

For phase 1, the demographic data and survey questions will be numerical coded and descriptive

statistics, including range and percentages, will be used to analyze the data. For the repeated survey data, a

repeated-measures analysis of variance (ANOVA) will be used.

For phase 2, the type of analysis that will be used, based on the qualitative research design, is a

content analysis. First, the recordings will need to be transcribed into a written script. This type of analysis

works to identify common words and phrases in participants' responses. The researchers will thoroughly

read and consider the content of the interviews. Underlying meaning of participants' words may be

considered. The researchers will organize the common words and phrases into groups. Categories will be discerned according to the groupings and then themes based on the word categories will be explored. An expert in content analysis and the participants themselves will be consulted for feedback on the themes, which may be adjusted according to their responses. Potentially, any patterns between different individuals based on their answers and ethnicities or socioeconomic statuses will be examined. In addition, differences in participants' responses between the two interviews will be explored.

CONCLUSION

Within this thesis, the researcher has learned about the rising costs of insulin and the several factors that should be taken into consideration as an effect of the costs. Upon research, there are non-modifiable and modifiable factors that can contribute to a better health outcome. Racial-ethnic disparities in any form will occur but taken into account that it results in having lack of literacy on their health, no clear communication, and providers not creating patient-centered goals when in care. It was observed that self-management is improved in association with the improvement of health literacy and education. The research question that was observed for this thesis is "what is the impact of the rising cost of insulin on a patient's ability to manage their Type 1 Diabetes?

Application of this knowledge in the clinical setting can be done by taking time to communicate and provide an understanding of the patient's situation and what their behaviors are like. By getting a better understanding of the clients and their individual situations at hand through surveys and interviews which in turn can establish rapport for more info to be shared.

This proposed research advanced the profession of nursing by finding ways to provide patient advocacy. Trends are starting to pick up such as Mark Cuban's pharmaceutical company that works to provide medications at a low price where it is more cost-effective for people who otherwise would not be able to afford them. This movement was inspired by Cuban's observation seeing that populations that may

be more disadvantaged than others may not find their basic medications affordable. This company has yet

to reach the insulin market but currently provides oral diabetes medications given a doctor's note. This is a

big step in observing better control of one's diabetes.

The next step that still needs to be done is working to implement what is done in the study and continue to

work with clients past the end of the study time. Healthcare providers should take into consideration ways

to provide better care, education, and support to their patients and open up more accessibility to them.

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https://doi.org/10.1177/1742395313475674

X.**APPENDIX**

Type 1 Diabetes & the Effects of the Rising Costs of Insulin on Self-Management Literature Table

Authors/ Citation	Purpose/ Objective Study	Sample - Population of interest, sample size	Study Designs	Study Methods	Major Finding(s)	Strengths	Limitations
Agarwal, S., Kanapka, L. G., Raymond, J. K., Walker, A., Gerard-Gonzalez, A., Kruger, D., Redondo, M. J., Rickels, M. R., Shah, V. N., Butler, A., Gonzalez, J., Verdejo, A. S., Gal, R. L., Willi, S., & Long, J. A. (2020). Racial-Ethnic Inequity in Young Adults With Type 1 Diabetes. The Journal of clinical	To assess racial-ethnic disparities in young adults with type 1 diabetes and reasons for glycemic disparity for other reasons than socioeconomic status.	300 young adults with type 1 diabetes for more than 6 months ranging from 18-28 years old	One-time cross-sectional study	Participants were given questionnaires on a electrical device (laptop or computer) that lasted from in between 15-40 minutes	Major findings from this research is that there is a large glycemic disparity with modifiable factors that demonstrate inequity. It was indicated that racial-ethnic disparities existed whether or not diabetes technology were	Strengths of this study are the diverse population of participants, age group and community	Limitations of this study is the one time cross-sectional study made to maximize data capture, limitations of social contextual factors, participants were recruited from diabetes centers with individuals able to understand English only materials and most participants were Hispanic patients.

Authors/ Citation	Purpose/ Objective Study	Sample - Population of interest, sample size	Study Designs	Study Methods	Major Finding(s)	Strengths	Limitations
endocrinology and metabolism, 105(8), e2960–e2969. https://doi.org/10.1210/cli nem/dgaa236					covered		
Crossen, S., Xing, G., & Hoch, J. S. (2020). Changing costs of type 1 diabetes care among US children and adolescents. Pediatric Diabetes, 21(4), 644–648.	To identify the mean annual cost of type 1 diabetes care based on increased use of technology and decrease of hospitalizations.	9445 participants from between January 1 2012 to December 31 2016 with a diagnosis of Type 1 Diabetes and younger than 18 years old	Retrospective analysis of T1D medical costs from 2012 to 2016	Data was sourced by data claims and linked socioeconomic status,age, ethnicities and geographical regions around the United States.	Major Findings from this study is the cost of type 1 diabetes driven by increase in insulin prices and cost of diabetes technology.Results showed that the mean annual cost for type 1 diabetes care increased to $17,060	Strengths of this study is the large participation size in age, gender, race and region.	Potential limitations in this study is the generalizability in finding costs for the insured youth and long-term cost effectiveness of type 1 diabetes care. There is an increased group of white, males from the South which may increase bias and generalizability.

Authors/ Citation	Purpose/ Objective Study	Sample - Population of interest, sample size	Study Designs	Study Methods	Major Finding(s)	Strengths	Limitations
Julian, K., Ba, D. M., Liu, G., Leslie, D. L., & Chuang, C. H. (2021). Out-of-Pocket Costs of Insulin and Diabetes-Related Supplies Among Patients With Type 1 Diabetes. Clinical Therapeutics, 43(7), 1272–1277. https://doi-org.dominican.idm.oclc.org/10.1016/j.clinthera.2021.05.008	To assess the financial burden of diabetes care on patients and out-pocket costs of diabetes care.	570,111 patients ranging from 0 to 64 years old with a mean age of 44. Participants must have a type 1 diabetes diagnosis and prescription of insulin during the enrollment of the trial from the years 2005-2017.	Quantitative retrospective analysis of patients covered by diverse insurance plans along the United States from 2005-2017	Data consisted of reimbursed health care claims and data collected to quantify out-of-pocket costs for insulin and diabetes supplies	Major findings from this study is out of the 570,111 patients, the mean inflation-adjusted annual out-of-pocket cost for each patient for insulin from $270 to $384 by 2017. Costs have increased following each year resulting in the 42% increase	Strengths of this study is the 12-year testing period, represents all 50 states and follows all age groups between 0 to 64 years of age.	Retrospective data collection could include data that is no longer or less relevant.

Additional, limitations of this study consisted of not including patients that are uninsured, adults over the age of 65 and patients that receive private insurance. The data also only analyzes from one company and did not collect each patient's full demographics. The study excluded US patients that bought their insulin outside of the United States, drug assistance programs or other use of drugs. |
| Riahi S, Sombra LRS, Lo KB, Chacko SR, Neto AGM, Azmaiparashvili Z, Patarroyo-Aponte G, Rangaswami J, Anastasopoulou C. | To observe the effects of diabetes controlling outcomes of client visit | 166 patients from a diabetes subgroup admitted at the medical center during that timy- | Retrospective observational study for patients over the age of 18 | All participants involved in the study are adults admitted from the Einstein Medical Center | Major Findings from this study is that among the patients that were infected with COVID-19, use of insulin therapy | Strengths of this study is a vast population of participants and varied inpatient and outpatient participants. | Limitations of this study is that it is a retrospective single center design, we must depend on the fact that the participants are compliant with their medications and insulin and most have high risk of comorbidities predominantly coming from the African American community. Due to this findings can be biased and generalized |

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Insulin Use, Diabetes Control, and Outcomes in Patients with COVID-19. Endocr Res. 2021 Feb-May;46(2):45-50. doi: 10.1080/07435800.2020. 1856865. Epub 2020 Dec 4. PMID: 33275067.				from March first through April twenty-four, two thousand twenty-two diagnosed with COVID-19 and diabetes	independently is associated with inpatient mortality		
Scott, A., O'Cathain, A., & Goyder, E. (2019). Socioeconomic disparities in access to intensive insulin regimens for adults with type 1 diabetes: a qualitative study of patient and healthcare professional	To analyze the improvements that should be enforced in healthcare for vulnerable populations and provide research findings for policy making.	28 patients with type 1 diabetes and 6 healthcare professionals involved in providing diabetes care	Qualitative descriptive study	50 to 70 minute in person-Interviews that were analyzed using thematic approach	Major Findings from this research is that lower socioeconomic groups experienced less accessibility to intensive insulin regimens. Difficulty of accessibility comes from poor health literacy, a	Strengths of this study are the several interview types with different types of patients and doctors, gaining perspective from two points of view.

The study gathered a diverse group of male and female adults and age groups ranging from 20 to 79. | Limitations of this study consist of having fewer individuals representing the lower socioeconomic classes and may misrepresent that community.

The study excluded individuals who are non-English speakers which can lead to selection bias, |

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perspectives. International journal for equity in health, 18(1), 150. https://doi.org/10.1186/s12939-019-1061-8					poor quality of communication and healthcare professional goals that do not align.		
Vest, B. M., Kahn, L. S., Danzo, A., Tumiel-Berhalter, L., Schuster, R. C., Karl, R., Taylor, R., Glaser, K., Danakas, A., & Fox, C. H. (2013). Diabetes self-management in a low-income population: impacts of social support and relationships with the health care system.	To study the support of resources in individuals living with diabetes in a higher poverty setting. By observing this, a prompted discovery on how the community self-manages their diabetes.	34 patients in Buffalo, New York	Qualitative Descriptive study	Semi-structured interviews	Major Findings from this research is diabetic self-management is identified based on three criteria of the influences of social support networks between people, the relationship between the patient and the doctor and the	Strengths of this study is that the population is targeted in a specific vicinity with diagnosed diabetes. Innovative study to describe needs in a lower income population	There were several limitations in the study due to the population interviewed primarily coming from one medical practice, predominantly females were interviewed and the translations of each of the interviews are subjected to inaccuracies. Due to the size of the study being so small, there are concerns for being unable to analyze each ethnic group.

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Chronic illness, 9(2), 145–155. https://doi.org/10.1177/1742395313475674					nature of the relationship between the patient and the health care system. Needs that were not met for the patient were also analyzed and highlighted.		