Literature Review

Diabetes mellitus is a disease of inadequate control of blood levels of glucose. More than 30.3 million people have diabetes in the United States and 84.1 million adults have prediabetes (CDC, 2018). Self-managing diabetes is a fundamental approach to controlling type two diabetes and preventing associated complications from diabetes (Lorig et al., 2001). In 2018, the American Diabetes Association recommended "healthful eating patterns, emphasizing a variety of nutrient-dense foods" to help "attain individual glycemic, blood pressure, and lipid goals" and to "delay or prevent the complication of diabetes." Continuous glucose monitors (CGM) are devices that can measure interstitial glucose concentrations over consistent intervals for several days. CGM's have led to a clinical shift in the management of diabetes by monitoring real-time glycemic levels (Bergenstal et al., 2011). This device has the capability to enable glucose level trending alerts, condition related predictive notifications, and the ability to make care plans based off glycemic levels from self-monitoring blood glucose (The Juvenile Diabetes Research Foundation, 2008).

Prevalence for diabetes among ethnicities vary with several reasons contributing to these disparities. Health behaviors, socioeconomic factors, family history of diabetes, biological factors, and environmental factors are explanations for ethic differences in diabetes (Elbein, 2009; Ross, 2010). Additionally, diabetes prevalence is substantially higher in rural populations in comparison to urban populations (Towne et al., 2017). In the rural area Carteret County, North Carolina diabetes is the eighth leading cause of death. With 10.4 percent of people living in poverty in the county, residents are faced with challenges that prevent them from managing this disease autonomously (Carteret Health Department, 2019).

Although diet quality has improved overall in the U.S., a cross-sectional analysis reported that adults with both diabetes and low SES and/or food insecurity experience important disparities in diet quality (Orr et al., 2019). As this is one of the major self-managing techniques for diabetes it is critical to evaluate the needs of people in Carteret County, especially those receiving free services at the Broad Street Clinic. Patients at this free clinic are likely to engage in certain unhealthy dietary practices that come along with the culture due to the geographic location. One study that used the Southern Community Cohort found rates of obesity-associated diabetes were exceptionally high among low-income adults (Conway et al., 2018). To avoid increases in diabetes in future years it is important to cease obesity rates as a preventative measure in these populations. Another cross-sectional study found that living in a poor neighborhoods increased the odds of having diabetes for poor blacks and whites (Gaskins et al., 2014). For the community to address these needs, policymakers should address the problems that are created by concentrated poverty, such as the lack of access to reasonable priced fruits and vegetables.

A literature review done on CGM gathered several articles that displayed the results from using these monitors in relevance to a patient's HbA1c. Following the outcomes of these studies, Ehrhardt et al. concluded that using Real Time-Continuous Glucose Monitoring should be used for a prevention tool of managing diabetes. These devices can be involved with adjusting to lifestyle changes, weight reduction, and potential decrease to insulin and other medications in patients with type 2 diabetes. Other studies have declared CGM as a beneficial use for type 2 patients including the elderly as well (Azhar et al., 2020). Along with CGM usage is self-managing this disease, with the help of the provider as well. One study found that participants felt providers were not adequately equipped to deal with the different cultural and social aspects

that come along with the self-management of diabetes (Aweko et al.,2018). This is important to acknowledge when administering these devices in a clinical setting, like the Broad Street Clinic, to recognize the existing knowledge related to diabetes and CGM published.

The research being done at the Broad Street Clinic will be similar to the studies described above by evaluating the effectiveness of CGM and acknowledging the challenges that come with self-managing diabetes in low-income settings. However, it will differ by investigating self-management through CGM in low-income patients. Being able to conclude that this treatment method is feasible and effective in a free clinic setting, will prove there are alternative ways to care for diabetes in the future for patients that typically have higher prevalence of the disease due to their income.

References

American Diabetes Association. (2018). Summary of revisions: standards of medical Care in Diabetes-2018. *Diabetes Care.*;41(Suppl 1):S4–S6.

Aweko, J., De Man, J., Absetz, P., Östenson, C. G., Swartling Peterson, S., Mölsted Alvesson, H., & Daivadanam, M. (2018). Patient and Provider Dilemmas of Type 2 Diabetes Self-Management: A Qualitative Study in Socioeconomically Disadvantaged Communities in Stockholm. *International journal of environmental research and public health*, *15*(9), 1810. https://doi.org/10.3390/ijerph15091810

Azhar, A., Gillani, S. W., Mohiuddin, G., & Majeed, R. A. (2020). A systematic review on clinical implication of continuous glucose monitoring in diabetes management. *Journal of pharmacy & bioallied sciences*, *12*(2), 102–111. https://doi.org/10.4103/jpbs.JPBS_7_20

Bergenstal RM, Tamborlane WV, Ahmann A, Buse JB, Dailey G, Davis SN, et al. (2011). STAR 3 Study Group Sensor-augmented pump therapy for A1C reduction (STAR 3) study: results from the 6-month continuation phase. *Diabetes Care.*;34:2403–5.

Carteret County Health Department. 2019 State of the County Health (SOTCH) Report. Carteretcountync.gov. https://www.niddk.nih.gov/health-information/diabetes/overview/managing-diabetes/continuous-glucose-monitoring. Accessed April 23, 2021.

Centers for Disease Control and Prevention. CDC National Diabetes Report. Available at: https://www.cdc.gov/diabetes/data/statistics/statistics-report.html. Accessed June 8, 2021.

Conway, B. N., Han, X., Munro, H. M., Gross, A. L., Shu, X. O., Hargreaves, M. K., Zheng, W., Powers, A. C., & Blot, W. J. (2018). The obesity epidemic and rising diabetes incidence in a low-income racially diverse southern US cohort. *PloS one*, *13*(1), e0190993. https://doi.org/10.1371/journal.pone.0190993

Elbein SC. (2009) Genetics factors contributing to type 2 diabetes across ethnicities. *J Diabetes Sci Tech*;3(4):685–689.

Gaskin, D. J., Thorpe, R. J., Jr, McGinty, E. E., Bower, K., Rohde, C., Young, J. H., LaVeist, T. A., & Dubay, L. (2014). *Disparities in Diabetes: The Nexus of Race, Poverty, and Place*. American Journal of Public Health; 104(11): 2147–2155.

Lorig K.R., Sobel D.S., Ritter P.L., Laurent D., Hobbs M. (2001). Effect of a self-management program on patients with chronic disease. *Effic. Clin. Pract.*;**4**:256–262.

Orr, C. J., Keyserling, T. C., Ammerman, A. S., & Berkowitz, S. A. (2019). Diet quality trends

among adults with diabetes by socioeconomic status in the U.S.: 1999-2014. *BMC endocrine disorders*, *19*(1), 54. https://doi.org/10.1186/s12902-019-0382-3

Ross NA, Gilmour H, Dasgupta K. (2010). 14-year diabetes incidence: the role of socio-economic status. *Health Rep.*;21(3):19–28.

The Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group. (2008) Continuous glucose monitoring and intensive treatment of type 1 diabetes. *N Engl J Med*.;359(14):1464-1476.

Towne SD, Bolin J, Ferdinand A, Nicklett EJ, Smith ML, & Ory MG (2017). Assessing Diabetes and Factors Associated with Foregoing Medical Care among Persons with Diabetes: Disparities Facing American Indian/Alaska Native, Black, Hispanic, Low Income, and Southern Adults in the U.S. (2011–2015). *International Journal of Environmental Research and Public Health*, 14(5), 464. doi:10.3390/ijerph14050464