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Polypharmacy Teaching in the Acute Setting

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Polypharmacy Teaching in the Acute Setting Benchmark Study

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Acknowledgments

First of all, this has been a challenging journey for me. The work was hard but very doable; I had difficulties finding the time between work, home, family, and taking care of myself. This journey started at the beginning of COVID; a lot has happened since then, especially in the nursing field. I would not have been able to get all of this accomplished without the help of my husband and daughters. I want to thank all the instructors for their feedback on assignments and discussions. I would also like to thank all my fellow students for encouraging words throughout our discussions. Everyone has had great ideas that will only enhance the nursing practice.

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Executive Summary

Within stable economic societies, polypharmacy has become a phenomenon that can be more harmful, although medications prescribed are with good intentions. Education is integral to nursing responsibilities; it is an intervention tool to help patients affected by polypharmacy. The interest in polypharmacy stems from witnessing the lack of patient education within the acute setting, and the lack poses a greater risk for adverse drug events (ADEs). The healthcare industry's responsibility is to help alleviate the adverse effects that polypharmacy causes, such as falls, adverse drug reactions, hospitalizations, mortality, and cognitive mental (Fried, 2014).

A new performance improvement project (PI) will be implemented to improve patient education on polypharmacy. Each department will have its own goals, but this focus is on the emergency department (ER). In the ER, the nurse is the first to recognize the effects of polypharmacy; the charge nurse and provider should be immediately notified so that a care plan with appropriate interventions can be quickly implemented. Patients must be educated on new medications that include dosages, side effects, and potential risks, and this should be an essential teaching tool for all healthcare staff. A courtesy visit copy will be provided to the patient's primary care provider with an alert to the ADE or the potential. The plan will follow the patient until discharge from the ER or an inpatient setting. Evaluation will be after a thirteen-week implementation through chart reviews, patient follow-up, and the number of polypharmacy related admits. After implementing this PI project, the goal is to improve the patient's knowledge base on the practice of polypharmacy, hoping for successful outcomes by potentially reducing ADEs and improving patient awareness. Nurses are responsible for educating patients and their families on how to take control of their health by knowing their disease processes and each prescription taken by the patient.

Rationale

According to Melnyk & Fineout-Overholt, patient-centeredness is required for patient preferences and values in evidence-based decision-making (pg. 227). Reliable studies and research that lead to evidence-based practice must be achievable and current (Melnyk & Fineout-Overholt, 2018, pg.226). With research into polypharmacy, the focus is on the best obtainable outcome keeping in mind patient safety and education on self-awareness about their health. A patient in the right state of mind would prefer optimal health with little to no prescriptions (Rx) if possible. Fortunately, with the present health advances, Rxs have been able to help many individuals with acute and chronic ailments. However, on the other side of the spectrum, some patients have been plagued with multiple diseases (multimorbidity) requiring numerous Rx, hence the term polypharmacy. Each new Rx requires new education and the more Rx individuals take because of multimorbidity, the more education the medical professional would be ethically bound to provide. As stated by Melnyk & Fineout-Overholt, page 227, "the clinician must act in the patient's best interests and do as little harm and as much good as possible.

An adverse drug reaction (ADR) unrecognized by clinicians may lead to what is known as a "prescribing cascade" when a new prescription is given to treat the ADR, presenting an additional risk to multimorbid patients (Menditto et al., 2019). Unfortunately, this scenario leads to polypharmacy and is accepted in the United States. Multimorbid patients usually require more than one specialist. Patients are not diligent about self-monitoring their medications or keeping an adequately updated list risk therapeutic equivalents to treat an illness or symptoms. According to an article published in the Journal of the American Geriatrics Society, sixty-six percent of the

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2402 patients studied were discharged from the hospital setting and were released with a potentially inappropriate medication (PIM) (Weir et al., 2020).

Literature Synthesis

There are dilemmas surrounding the appropriate management of deprescribing in multimorbid patients who practice polypharmacy (Allatoona et al., 2016). Studies define *polypharmacy* as taking five or more medications or an excessive number of drugs (Martinez-Gomez et al., 2018) (Wu et al., 2021). Deprescribing is defined as safely and consistently decreasing unnecessary medicines that no longer benefit the patient (Ailaboni et al., 2016). Barriers for comorbid patients and healthcare professionals are the lack of guidelines for safe prescribing methods and deprescribing interventions; most policies are geared toward a single disease paradigm (Muth et al., 2021) (Payne, 2016) (Wu et al., 2021). Studies have concluded that polypharmacy dramatically affects a patient's quality of life (QOL), and deprescribing medications with favorable lifestyle changes increase the QOL (Martinez-Gomez et al., 2018) (Wu et al., 2021). Even though there are conflicts such as time and no incentive for physicians and pharmacists, regular clinical medication reviews (CMRs) should be performed to help improve QOL and reduce adverse drug reactions (ADEs) (Earl et al., 2020) (Piccoliori et al., 2021).

Although some physicians accept pharmaceutical benefits and pharmacies receive incentives for many prescriptions, business models need to be changed for the patient's benefit and to help curb polypharmacy (Laberge et al., 2021). Due to the cost of intervention implementation, and limited interest from physicians, the deprescribing implementation is challenging (Laberge et al., 2021). Although limited prediction models exist, there are tools to help screen electronic health records (EHRs) for potentially inappropriate medications (PIMs),

including screening tools of older persons' potentially inappropriate prescriptions (STOPP), Beers Criteria, Drug Burden Index (DBI), with quality indicators, and codes to help identify chronic diseases (ICPC) (Earl, 2020) (Muth et al., 2019) (Piccoliori et al., 2021) (Wu et al., 2021). Using the Beers Criteria shows that 6.1% of prescriptions may be a PIM (Piccoliori et al., 2021).

Evidence shows that some patients who practice polypharmacy and take certain classifications of medications are more prone ADEs or drug-to-drug interactions, increasing mortality and decreasing the QOL (Martinex-Gomez et al., 2018). There is a 58% correlation between patients who suffer from depression, and practice polypharmacy is more likely to suffer an ADE; therefore, patients who suffer from depression should be subject to frequent CMRs (Burger et al., 2017) (Doos et al., 2014) (Piccoliori et al., 2021). Studies conclude that cardiovascular deaths tend to increase with the number of medications taken and decrease through safely deprescribing and favorable lifestyle deviations (Martinez-Gomez et al., 2018). Lifestyle behaviors should be measured against medication categories to develop effective strategies and proper patient-oriented goals,

6.6% of hospital admissions can be attributed to ADEs due to polypharmacy (Ciummo et al., 2020). Evidence shows that 57% of patients with four or more conditions have additional prescriptions at discharge from the inpatient setting (Doos et al., 2014). Also, there is a 7.8% readmission rate within thirty days after release for comorbid patients who practice polypharmacy (Pereira et al., 2021). Because of the risks of developing harmful outcomes, reliable methods must be in place to identify those at risk for polypharmacy ADEs at discharge (Muth et al., 2021). Because of these instances, the need for healthcare individuals to recognize polypharmacy is imperative to alleviate the harmful effects polypharmacy can create.

There is an urgent need to help teach patients self-efficacy and set the standard for shared decision-making with patient preferences and goal setting (Muth et al., 2019). All the research to date it is strongly suggested the need for coordinated care between physicians for effective, sustainable patient outcomes (Doors et al., 2014) (Bleijenberg et al., 2017) (Ailabonuni et al., 2016) (Earl et al., 2020) (Burger et al., 2017) (Muth et al., 2019). Health care professionals should deliver adequate treatment communication, safety instructions, strategies for self-care, follow-ups, and integrated care to develop optimal patient outcomes and monitor intervention effectiveness (Bleijenberg et al., 2017) (Muth et al., 2019). It has been proven that interventions through healthcare-led programs with follow-ups, family partnerships, and patient-centeredness, comorbid patients have a higher QOL and better outcomes (Bleijenberg et al., 2017). All the studies concluded that an integrated approach and standard practice guidelines are essential for physicians treating multimorbid patients who practice polypharmacy.

Stakeholders

In the practice setting, the stakeholders, which include the physicians, nurses, administrators, payment sources such as public and private insurances, patients, and families, should be aware of the possibility of a PIM prescribed on any given day. Patients trust the medical professional to make the right decisions to help eliminate the PIMs; protocols should be in place and followed. A change is needed to help eliminate the effects of polypharmacy and allow the patients to be free from ADEs. If patients are educated on the need for change and physicians are informed on the necessity to de-prescribe safely, polypharmacy and the potential for ADEs will become less common.

Implementation

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A new program implementation must begin at the top and may offer an incentive for compliance and participation. According to one study, the lack of consistency seems to be the biggest challenge when implementing a new project facility-wide (Mathieson et al., 2019). Polypharmacy has become an interest to many in healthcare not only because of the adverse drug events (ADEs), other considerations include cost, patient culture, patient adherence, and medication effectiveness. Nurses must be educated on the importance of medication teaching, recognizing polypharmacy, and when more than the standard intervention is warranted. Not only should more patient education be required, but the healthcare workers should become efficient in recognizing the effects of polypharmacy and key the phrase "more is not always better." With more research into polypharmacy, the future of healthcare and "Big pharma" will have to conform to patient consideration when prescribing.

Before the actual implementation of the project, the nursing staff must be educated on how to recognize polypharmacy and ADEs. The nursing staff should be familiar with the most recent copy of the Nurses Drug Handbook and be alert to the need for continuing education after discharge. Nurses must be trained and diligent in identifying and deterring potential drug-to-drug interactions. The nurse education will be assigned and required before PI project implementation.

During brief training sessions, the nurses will be trained to recognize polypharmacy and any possible ADE admitted to the ER. For analysis, the nurse will reconcile the patient's current medications for the physician and the nursing team. Medication reconciliation and education are essential and a nurse’s priority if drugs are administered while patients are under their care. Not properly reconciling patient medication may lead to duplicating existing therapies, incorrect dosages, and omitting needed medicines at discharge time (Medication, 2019). The medication

reconciliation taskbar will remain highlighted until completed by the primary nurse. The charge nurse and attending ER physician are alerted to the findings. During the time in the ER, the primary nurse will ascertain the patient's and family's knowledge based on the currently prescribed medications and determine if further intervention is needed. At the time of discharge from the ER, the patient will provide verbal and written education to the patient, caretaker, or family on any new medications the patient is prescribed. A 2019 article titled Medication Reconciliation states that an adverse drug event is more likely to occur after a hospital discharge. If the patient is admitted to the floor, the hospitalist and new primary nurse will be aware of the findings. As a courtesy, the primary physician will be notified along with an alert to the ADE or possible ADE.

Timetable/Flowchart

The timetable/flowchart, as seen in Appendix B, will be as follows. Before anything is implemented on the floor, the nurses must attend the Foundations of Polypharmacy session. There will be an option of four different times, lasting approximately one and a half hours. This discussion will be presented by nursing leaders and the pharmacist. These sessions will be offered during the first two weeks of this implementation. During the third through fifth weeks, several modules will be completed on nursing responsibilities through continuing education issued by the education department. In the sixth through the thirteenth weeks, the implementation will begin, and at this time, nurse leaders will be observant and available to answer questions. As discussed in data collection, after the thirteenth week, data will be collected through chart audits, follow-up phone calls, leader rounding, and comparable ADEs before implementation will be compared. Information from follow-up phone calls will be whether the

patient received proper medication education, verbal and written and whether the patient fully understood and retained the education and information provided by the staff.

Data Collection Methods/Planned

After the first thirteen-week period ends, chart review will determine if the nurses recognized ADEs, which will be noted in the chart by the physician and charge nurse being notified. Chart reviews will be completed on patients with a medication reconciliation of five or more mediations. The chart review or patient phone interviews will determine if proper pharmaceutical education was given. Measurable data will compare ADEs in the same period from one year prior. If the ADE admit percentages are less and adequate education is noted in the charts, it will be concluded that the PI project is a success. Evaluations will continue, and improvements will be implemented as needed.

Cost Benefit Discussion

The United States spends over $500 billion yearly on prescription drugs, and at this time, the cost is rising three times the inflation rate (Joseph, 2021). A UK global study suggested that guidelines for most clinical settings are not geared toward co-morbid patients but rather for a one disease process (Payne, 2016). An adverse drug reaction (ADR) unrecognized by clinicians may lead to what is known as a “prescribing cascade” where new prescriptions are given to treat the ADR, presenting an additional cost and risk to multi-morbid patients (Menditto et al., 2019). Healthcare professionals need to scale up deprescribing interventions and help reduce the cost associated with polypharmacy, which may enhance patient QOL (Laberge et al., 2021).

Polypharmacy is related to adverse drug events, which studies have shown can cause extended hospital stays (Fukuba et al., 2020). Studies have demonstrated adverse drug events

may include non-compliance, falls, overdoses, and drug interactions. Also, the Centers for Medicaid and Medicare Services follow the Hospitals Readmission Reduction Program, which may affect the hospital's profit if a patient is readmitted (Hospital, 2021). This ensures hospital policy is followed because it affects the hospital profit margin, making medication safety another sustainable factor for implementation.

Overall Discussion/Results

Evidence-based practice is crucial to researching an ethical and safe solution to a problem such as polypharmacy. There have been several instances when patients have not seen the provider for an extended period and health statuses have changed, but the medication regimen has not; therefore, adverse effects are frequently witnessed by ER staff. It is a daily and personal experience to educate patients and families about home medications after a polypharmacy-associated incident in the emergency room. A qualitative study cited that one of the main reasons for non-compliant patients is that they do not know why they are taking the medication or its use (Kobue et al., 2017). The ER is a frequent safety net in healthcare, including polypharmacy, therefore, making the ER a good start for polypharmacy education. It won't be easy to follow up on positive outcomes unless there is adherence to the implementation guide given for this PI project. Suppose this benchmark PI project can be implemented in the future. In that case, it is with the hope that other healthcare professionals will see the need for polypharmacy education and the patient's condition for an improved QOL.

Recommendations

While protocols prevent healthcare workers from inflicting potential harm, they benefit the patient and help produce superior outcomes. According to the U. S. Preventive Services Task

Force (USPSTF), protocols are the backbone of the medical industry and are based on evidence-based practice (United, 2022). Implementing this project into protocol is a step to unraveling the errors occurring with polypharmacy. Furthermore, a successful endeavor will take strategic and coordinated care of all involved, from administration, doctors, nurses, patients, and families. Implementing this project is a step in the right direction to help improve patients' QOL. While polypharmacy education is genuinely needed and essential, it is imperative to emphasize the value of self-efficacy and the responsibility individuals have over their health. The Joint Commission has made medication safety a 2022 goal making this implementation even more critical now.

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Appendix A

Literature Evaluation Table

Clinical Question (PICOT): In comorbid patients how does the practice of polypharmacy compared to only clinically necessary medications affect health and well-being during a period of study?

Citation: author(s), date of publication& title	**Purpose of Study**	**Conceptual Framework**	**Design/ Method**	**Sample/Setting**	**Major Variables Studied and Their Definitions**	**Measurement of Major Variables**	**Data Analysis**	**Study Findings**	**Appraisal of Worth to Practice** Strength of the Evidence = 1) **Level of evidence +** 2) **Quality [study strengths and weaknesses])** 3) **YOUR Recommendations**
KS#1 Doos, L. et al. 2014, Multi-drug therapy in chronic condition multimorbidity: a systematic review	Synthesize the current evidence on patterns of multi-drug prescribing in family practice	Interventions that lead to an effective outcome involving comorbid patients involved in polypharmacy	SR 5 databases searched. Articles in English dated 2003-2011. Surveys, questionnaires, EHRs, prescription records, exploratory analysis', Cross-sectional studies	N=11 1017 articles identified, 198 articles screened, 23 papers assessed and 11 studies met criteria Studies include 18yrs and older	IV=CC Coordinated care, the need for CC by physicians who have patients with comorbidities requiring multiply specialists and multi-drug therapies DV= FR further research to deliver appropriate care	(CC)6 chronic conditions studied With(MDT) multi-drug therapies (taking 5 or more Rx at one time) CC with depression	CI=confidence interval OR=Odds Radio (X)= mean	(CC)&(MDTT) with depression OR=4.32, 95% CI 1.4-5.96 OR=4.32, 95% CI=3.13-5.96 OR=0.58, 95% CI0.35-0.96 OR=0.3 OR=1.07, 95% CI 1.03-1.11 OR=0.94, 95% CI 0.90-.099 X=ages	Evidence LEVEL I Weaknesses: Terminology Challenges: potential over-lap between multiple drug therapies and specific term polypharmacy. Polypharmacy can focus on older populations Weakness was identified, then combinations were used in the search Review: The polypharmacy approach may be harmful, including drug interactions, increased mortality, cost Conclusion/recommendation: Healthcare professionals need further development and studies to better manage comorbid patients practicing polypharmacy.

ADE- Adverse drug event, CBS-statistics of Netherlands, CBA-cost benefit analysis CC-coordinated care, CEA-cost-effective analysis, CUA-cost utility analysis, DBI-drug burden index, CI-confidence interval, DDI- drug-to-drug interactions, DV-dependent variable, ICD-international classification of diseases IV-independent variable, MDT-multi drug therapy, OR-Odds ratioDV-dependent variable, HP-health promotion, HP-hypothetical profile, IQ-interview questions, IV-independent variable, PCS-primary care setting, PIM-potentially inappropriate prescriptions, NIVEL-PCD-Netherlands institute of health services research primary care database, QALY-quality-adjusted life years, RCT-random control trial, SKF-foundation of pharmaceutical statistics, SR-systematic review, STOPP- screening tool of older persons potentially inappropriate prescriptions,

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KS#3 Ailabouni, N. General practitioners' insight into deprescribing for the multimorbid older individual: a qualitative study, 2016, *70*(3), 261–276	Explore general practitioners' (GP) opinions & awareness of describing in an older multimorbid patient practicing polypharmacy.	The study highlights the lack of clarity around deprescribing in multimorbidity and guidelines may help to clarify evidence-based medicine relating to controversial areas and could decrease the variations	Qualitative study Face to face in depth interviews with GPs that was transcribed verbatim and for thematic analysis.	Random sampling 40 GPs contacted 10 GPs consented to the study	IV: GP general practitioners GP opinions on safely deprescribing in multimorbid patients DV: D-deprescribing Lack of clarity on deprescribing in comorbid patients practicing polypharmacy	Research team (PhD) in medical setting IQ- interview questions IQ that explored GPs challenges when prescribing for older adults HP-hypothetical profile GPs asked to review, reduce, dc or change medications in the HP	Constant comparison techniques Analysis using nVivo software Gibbs Qualitative data analysis	Results were the opinions of GPs of interview questions. A table was made to for each medicine to look for similarities or differences in preventive and symptomatic medicines	Evidence Level: VI Strengths: Using the HP GPs shared their present knowledge of evidence based on medicine without having to consider realistic pressures. Face to face interviews GPs may have been more comfortable stating their unbiased opinions. Limitations: GPs may have stated socially desirable responses, which does not reflect their routine clinic practice. Using the HP test results were unavailable for consideration Conclusion: The study highlights the consensus for deprescribing guidelines, which GPs can use to guide their decision making when reviewing medication regimens Recommendations: Use this study as a keeper study as it shows insights into GPs views on the practice of deprescribing. This can assist with PICOT into understanding how patients will understand the process of deprescribing

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KS#4 Earl, T. R., Katapodis, N. D., Schneiderman, S. R., & Shoemaker-Hunt, S. J. (2020). Using Deprescribing Practices and the Screening Tool of Older Persons' Potentially Inappropriate Prescriptions Criteria to Reduce Harm and Preventable Adverse Drug Events in Older Adults. *Journal of Patient Safety*, S23–S35.	The effect of intervention for deprescribing and using the STOPP criteria on preventable ADEs for older adults. Pge 23 under methods	effect of interventions for deprescribing and using the STOPP criteria on preventable ADEs for older adults? Deprescribing is an approach and the STOPP criteria are used in a screening tool that was part of the interventions reviewed. Pg 23 in methods	SR using 2 data bases with literature published 22008-2018. Included 26 studies, with one systematic review. Studies include RCTs, decision support tools, education interventions, medication reviews by pharmacist and physicians. Economic studies. Used STOPP screening	N=14 studies for table 1, evaluating interventions regarding deprescribing N=12 studies and 1 SR for STOPP criteria Resident care settings, hospitals, primary care centers, community pharmacies, skilled nursing facilities, adult day centers	IV- STOPP criteria/depres cribing to reduce ADEs from polypharmacy DV-research needed on effectiveness of tools such as STOPP to eliminate PIMs and reduce ADEs	Burden index scores STOPP criteria Decreased hospitalizations Medication reductions Percentage decreases Decreased monthly medication costs Control group differences Decreased ADEs Reduced PIMs	Percentages reductions, ratios, clinical outcome, reduced ADEs, SR of literature, effects of interventions, observation of economic and clinical outcome	Percentages between control and intervention groups, evaluations, drug burden index scores, Edmonton frailty scale, Stopp criteria	Level of evidence Study contains both SR with meta-analysis Level I SR with descriptive studies Level V Strengths: effectiveness of STOPP screening to prevent ADEs, using pharmacist and physician led education and interventions Limitations by range of health care settings and study designs and small sample sizes. Reveals gaps for future research and interventions Recommendations: use STOPP embedded into CDS tools as with the recommendation of this study
KS 5 Burger, H., Holvast, F.,	Association between depressin and	In primary care late life depression leads to	Cohort study with a cross sectional	N=4477 Primary care	IV=depressio n multimorbidit	DBI	Kruskal-Wallis test	Critical drug reviews to reduce issues with	Level of evidence=IV

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Sinnige, J., Schellevis, F., Taxis, K., Van Hattem, B. A., & Verhaak, P.F.M. (2017). Late-life depression and the association with multimorbidity and polypharmacy: a cross-sectional study. *Family Practice, 34*(5), 539-545.	multimorbidity and polypharmacy could help practitioner identify patients at risk for adverse drug-related events	polypharmacy. Findings indicate need for regular Rx reviews using tools like DBI	observatinal method Data from 2012 using three databases (NIVEL-PCD), (SFK), (CBS)	setting in the Netherlands	ies, polypharmacy DV=DBI for review to prevent ADEs SES	ICPC codes identify chronic diseases Age, gender, SES scores	Mann-Whitney U test	polypharmacy in primary care Alternative treatments Target patients with chronic diseases and dpreession with behavioral intervention not pharmacological means	Strengths=number of patients, dispensed drugs rather than prescribed, routinely recorded data Limitations=correct coding by physicians, misclassified mental health Recommendations=using tools such as DBI for Rx reviews
KS 6 Blom, J. W., Bouvy, M. L., Gussekloo, J., Kwint, H. F., Verdoorn, S., (2019). Effects of a clinical medication review focused on	Assess the effect of a CMR focused on personal goals, QOL, in older person with polypharmacy	Randomization to control and intervention groups Pharmacists consulting with PCPs Numerous follow-ups	RCT (Medline) CMR focused on personal goals, QOL, with polypharmacy 315-intervention	N=707 out of 2290 35 pharmacies 12 different health problems	IV-polypharmacy DV-personal goals (PG), QOL, health problems	Polypharmacy measured with CMR PG, QOL, health problems measured with VAS & EQ-D5-DL Health problems measured with a questionnaire	S1 statistical analysis plan Descriptive statistics for patient characteristics Data analyzed with IBM SPSS statistics 24.0	CI-95% Improvements in QOL using EQ-VAS Reductions in the number of health problems that had moderate to severe impact on DL	Level of Evidence= II Strengths-personalized goal setting that was effective, study performed with daily pharmacy practice, experienced pharmacists, follow up with PCPs, to prevent bias all questionnaires recorded by independent research assistants Weakness: blinding impossible, risk of contamination, only 25% of 2290 participated, some goals may not have been realistic

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personal goals, quality of life, and health problems in older persons with polypharmacy: A randomized controlled trial (DREAMeR-study). *PLoS medicine*, *16*(5), e1002798.			group 314-control group ≥70 yrs. ≥7 long term medications Participants recruited from 4/2016-2/2017 Baseline/ 3-months/6-months	Netherlands				Reductions in long-term Rx CMR has effect on patient goals and preferences	Recommendations: More studies are needed for the prevention of polypharmacy. Pharmacists could become more involved with this issue using varieties of CMRs
KS7 Piccoliori, G., Mahlknecht, A., Sandri, M., Valentini, M., Vögele, A., Schmid, S., Deflorian, F., Engl, A., Sönnichsen, A., & Wiederman n, C.J.	Develop strategies to reduce polypharmacy and its well known harmful consequences	Study the epidemiology and associated factors of polypharmacy	Cross sectional study in Italy using 2012 Beers criteria to access DDIs and PIMs. Data analysed with descriptive methods, Wilcoxon rank-sums, Fishers and	270 GP sample n= 43 participating 579 patients	patients ≥8 Rx and age ≥75yrs, no terminal illness, excluding PRN meds	Demographid/biometric characteristics, diagnoses, medication related data, cognitive/affective status. Assessing DDIs and PIMs	2012 Beers criteria Lexi-interact database Wilcoxon rank-sums Fisher's exact test Spearman correlations	Results of polypharmacy associated with number of chronic conditions, higher number of DDIs and lower quality of life	Level of evidence=IV Limitations-OTC drug use, new drugs prescribed by specialist may not yet be in EHR, PRN medications excluded, Strengths-ability to include demographic and clinical characteristics. Also medications appropriateness and DDIs Conclusion-GPs should keep patients with multiple conditions, reduced health, and combinations of certain diagnoses under surveillance.

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(2021). Epidemiology and associated factors of polypharmacy in older patients in primary care: a northern Italian cross-sectional study. *BMC Geriatrics, 21*.			Spearmans correlations						This study is strong evidence of the quality of life for patients who practice polypharmacy. More tools need to be placed in EHRs to help guard agains DDI and PIM events.
KS 8 Laberge, M., Sirois, C., Lunghi, C., Gaudreault, M., Nakamura, Y., Bolduc, C., & Laroche, M. L. (2021). Economic Evaluations of Interventions to Optimize Medication Use in	Conduct a systematic review of economic evaluation of interventions intended at optimizing medication use in patients with multimorbicity and polyphamracy to determine if intervention	Study interventions aimed at optimizing medication use and present results on costs	SR Multimorbidity with at least two chronic conditions. Rx ≥5 Rx Published articles 2004-2020	Multimorbidity, polypharmacy, 3871 articles identified with 68 articles eligible for full text review 11 included in study	Polypharmacy multimorbidity, older adults	Interventions associated with medicatin expenditures	CEA, CUA, CBA, QUALY,	11 studies met criteria for full economic evaluation. Cost effectiveness of the intervention depend on factors of the intervention and willingness to pay for thresholds for marginal improvements to reduce ADEs	Level of Evidence = I Strengths-in-depth search strategy Limitations- relevant studies may have been missed by not evaluating relevancdes. Different definitions to polypharmacy. This study will be used to consider the cost of interventions and cost effectiveness. More research is also needed to estimate the cost of interventions

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Older Adults with Polypharmacy and Multimorbidity: A Systematic Review. *Clinical interventions in aging*, *16*, 767–779.	s are cost effective								
KS 9 Muth, C., Blom, J. W., Smith, S. M., Johnell, K., Gonzalez-Gonzalez, A. I., Nguyen, T. S., Brueckle, M. S., Cesari, M., Tinetti, M. E., & Valderas, J. M. (2019). Evidence supporting the best clinical management of patients with	Best clinical management of patients with myltimorbidity and polypharmacy	Identify and analyse available evidence-based clinical practice guidelines for multimorbidity or polypharmacy	SR Multistep consensus process involving multidisciplinary experts from seven countries.	18-multidisciplinary experts from 7 countries with an extraction of 250 recommendatins. Target population (risk factors)	Physiological status and frailty. Review of medication enocunters Risk factors Medical history	Ariadne princples	Ariadne framework Quality of . guidelines with MiChe checklist Thematic synthesis at a 2 day meeting	Need to patient preferences and goal setting, expectations, shared decision making, treatment options, individualized management, followup monitoring, care plan strategies	Level of evidence = I Limitations – themes selected and presented Strength – concluded that strong guidelines for interventions in regards to polypharmacy Conclusion – this SR will be used to highlight the need for further research to appropriate interventions on polypharmacy

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multimorbidity and polypharmacy: a systematic guideline review and expert consensus. *Journal of internal medicine, 285*(3), 272–288.									
#10 Article citation (APA): Wu, H., Kouladjian O'Donnell, L., Fujita, K., Masnoon, N., & Hilmer, S. N. (2021). Deprescribing in the older patient: A narrative review of challenges and solutions. *International Journal of General Medicine*,	provide a narrative review of the safety and efficacy of deprescribing interventions, challenges and solutions of deprescribing research and implementations in clinical practice, the benefits of using computerized clinical	Using the studies with the met criteria for deprescribing methods, the theory is stated as polypharmacy is a major challenge in healthcare for older people with associated risks of adverse outcomes. The	Mixed method Literature Review	Literature search focusing on systematic reviews published from 1/1/2016 to 3/1/2021. Using search terms deprescribing, polypharmacy, PIMs, challenges, barriers,	DV polypharmacy, deprescribing, PIMs IV barriers, quality indicator, clinical indicator, performance measures, obstacles	Systematic reviews analyzed by authors	Search strategy to review abstracts and title of each publication were reviewed to determine their relevance to research questions. Reviews were included if they fulfilled the following criteria.	Inappropriate medications contribute to morbidity and mortality. Deprescribing is an established management strategy to minimize polyphamracy	Level of Evidence =1 Strengths: plan-do-study-act cycles to facilitate deprescribing for polypharmacy Limitations: not a systematic review of systematic reviews. Limitations of traditional narrative reviews, risk for bias, overlaing reviews. Conclusion: this review contains many of the key elemants that are related to the polypharmacy and deprescribing

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Volume 14, 3793–3807. https://doi.org/10.2147/ijgm.s253177	decision support systems and quality indicators (QIs) in deprescribing in research and practice	review highlights the interest in deprescribing in reducing medication related harms in older individuals.		obstacles, quality indicator, clinical indicator, performance measures, aged older, geriatric. 83 systematic reviews and a narrative summary performed					
#11 Martinez-Gomez, D., Guallar-Castillon, P., Higueras-Fresnillo, S., Banegas, J. R., Sadarangani, K. P., & Rodriguez-Artalejo, F. (2018). A healthy lifestyle	The purpose of the study was to the study analysed 4yrs of a hospital register 2015-2018 to determine the risk of 30-day hospital readmission	Health expectancy can be attributed to healthcare including pharmaceutical treatments and age related chronic diseases is related to	Cohort Study	4008 with 83 excluded, stratified then randomly from clusters, then selected by sex and age strata. Six lifestyles considered	IV: polypharmacy, lifestyle, sex, age, education level, mortality rate DV: number of medications, behaviors	Kaplan-Meier method to calculate lifestyle behaviors Cox proportional hazards regressions to measure hazard ratios Log-rank tests to measure assess difference	Sex/age Education, BMI, BP, mental state, agility, chronic diseases electronic health records of 20,422 inpatient stays of polymedicated home dwelling older adults	Health expectancy can be attributed to the effectiveness and coverage of health care including pharmacological treatments but the age-related chronic conditions has resulted in increases in the number of	Level IV Strengths: Large representative sample. Variable collected by trained staff using standardized methods. Consistency Limitations: cofoiunding and associations may not implify causation. Self reported lifestyles which may cause bias. Lifestyle and drug treatments were obtained at baseline Recommendation: will use this study toward the capstone as it has many of the key factors associated with study.

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attenuates the effect of polypharmacy on total and cardiovascular mortality: a national prospective cohort study. *Scientific reports*, *8*(1), 12615. https://doi.org/10.1038/s41598-018-30840-9	associated with the medical conditions and drug regimens of polymedicated, older inpatients discharged home	polypharmacy. Polypharmacy associated with ADEs. Healthy lifestyles show to improve QOL and reducing medications		smoking, diet, etoh consumption, physical activity, sedentary behavior, and sleep duration. Education levels were recorded, medications classified by 3 categories 0-1 medications, 2-4 medications, then ≥5 medications		s in lifestyle behaviors	held in the hospital's register and identify polymedicated multimorbid patients readmitted within 30 days of discharge.	medications, known as polypharmacy. A healthy lifestyle has been shown to improve health in older adults, therefore, it is of interest to assess whether the adverse mortality effect of polypharmacy could be reduced by a healthy lifestyle.	
• #12 Health expectancy can be attributed to the effectiveness and coverage of health care	The purpose of the study was to the study analysed 4yrs of a hospital register 2015-2018 to determine the risk of	Examined the records of 20422 over a four year period of hospitalizations involving	Quantitative Cohort Study	20,422 electronic health records and 13,802 patients identified with sociodem	IV: Sociodemographic and clinical data DV 30 day readmission	Polypharmacy and multimorbidity used for this research, appropriate to answer research question	Data extracted into Microsoft Excel spreadsheet. Then imported into SPSS V.26.0 software ICD codes and CHOP interventions and drug prescriptions	CI=95% Readmissions patterns are comples, poorly understood-older patients are often co-morbid and have complex	Evidence IV Strengths: the data recorded in a comprehensive register Limitations: could not identify hospitalizations and readmits lost to follow-up and death outside of the hospital. And readmitted from another hospital.

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including pharmacological treatments but the age-related chronic conditions has resulted in increases in the number of medications, known as polypharmacy. Which has been associated with adverse health outcomes, poor treatment adherence, adverse drug reactions and	30-day hospital readmission associated with the medical conditions and drug regimens of polymedicated, older inpatients discharged home	polypharmacy in older adults. Then identify the risk of multimorbid patients practicing polypharmacy for readmission within thirty days.		ographic characteristics, medical conditions, readmissions and polypharmacy			during hospital stay	drug prescriptions	Recommendations: I will use this study, it has several key factors which are included in the capstone study.

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events, falls, fractures, cognitive function impairment, and hospitalizations. A healthy lifestyle has been shown to improve health in older adults, therefore, it is of interest to assess whether the adverse mortality effect of polypharmacy could be reduced by a healthy lifestyle.									

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Appendix B

Timetable/Flowchart

I. Required education to be completed before PI project implementation (class session and modules)

II. Patient admitted to ED

III. Medication reconciliation (Recognize Polypharmacy)(Recognize ADEs) This helps alleviate the possible prescription duplication or prescription synergistic or antagonistic effects of new Rx (Charge nurse rounding)

IV. Polypharmacy is recognized when a patient takes five or more prescriptions, the nurse notifies the ED physician or hospitalist, and the charge nurse

V. The nurse will determine the patient, family, or caretaker's understanding of medications. Is more intervention needed?

VI. Discharge from ED or inpatient setting with a clear understanding of all medications, including new discharge medications. Provide education materials when discharged and arrange a follow-up appointment with the primary care physician when discharged from the inpatient setting

VII. Notify primary care physician of ED visit (this is done unless the patient refuses at check-in)

VIII. Follow up with phone calls within two weeks of discharge (done by the assigned ED nurse, a case manager in the inpatient setting). Percentage rate of patients who retained education of polypharmacy vs. those patients who did not

Polypharmacy Teaching in the Acute Setting Benchmark Study

IX. After a 13-week implementation of this project, chart audits and compare percentages of admits with ADEs before implementation

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