

Discordant Chronic Comorbidities: Related Work Outline

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ABSTRACT

Abstract text. Abstract text. Abstract text. Abstract text.
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Categories and Subject Descriptors

H.4 [Information Systems Applications]: Miscellaneous;
D.2.8 [Software Engineering]: Metrics—*complexity mea-*
sures, performance measures

General Terms

Theory

Keywords

ACM proceedings, L^AT_EX, text tagging

1. DIABETES

- Barriers to Diabetes Management: Patient and Provider Factors [23].
 - A review of 80 diabetes studies, revealing that the major components of Type 2 Diabetes management are adherence, attitudes and beliefs about the disease, knowledge of diabetes, ethnicity and culture, language ability, financial resources, comorbidities, and social support.
- Failing the Challenge: Diabetes Apps and Long Term Adoption [15].
 - In structured interviews with 27 diabetes patients, the study found that patients stopped using diabetes management apps as the apps were too much work, produced negative emotions, and were not worth the time spent once their initial novelty wore off.
- Management of Diabetes and Hyperglycemia in Hospitals [4].

- The management of diabetes in the hospital is generally considered secondary in importance compared with the condition that prompted admission, and recent studies have focused attention to the possibility that hyperglycemia in the hospital is not necessarily a benign condition. The vicious cycle of stress-induced hyperglycemia and hypoinsulinemia subsequently causes maladaptive responses in immune function, fuel production, and synthesis of mediators that cause further tissue and organ dysfunction. Thus, the combination of hyperglycemia and relative hypoinsulinemia is mechanistically positioned to provide a plausible explanation for the poor hospital outcomes seen in observational studies.
- Medical Management of Hyperglycemia in Type 2 Diabetes: A Consensus Algorithm for the Initiation and Adjustment of Therapy [24].
 - Type 2 diabetes is epidemic. Its long-term consequences translate into enormous human suffering and economic costs; however, much of the morbidity associated with long-term microvascular and neuropathic complications can be substantially reduced by interventions that achieve glucose levels close to the nondiabetic range. Although new classes of medications and numerous combinations have been demonstrated to lower glycemia, current-day management has failed to achieve and maintain the glycemic levels most likely to provide optimal healthcare status for people with diabetes.
 - First step of the algorithm for the initiation and adjustment of therapy is well-validated core therapies lifestyle intervention and metformin. Lifestyle interventions to improve glucose, blood pressure, and lipid levels, and to promote weight loss or at least avoid weight gain, should remain an underlying theme throughout the management of type 2 diabetes, even after medications are used. Also, metformin is recommended as the initial pharmacological therapy, in the absence of specific contraindications, for its effect on glycemia, absence of weight gain or hypoglycemia, generally low level of side effects, high level of acceptance, and relatively low cost.
 - Second step is the addition of a second medication. If lifestyle intervention and the maximal tol-

erated dose of metformin fail to achieve or sustain the glycemic goals, another medication should be added within 2–3 months of the initiation of therapy or at any time when the target A1C level is not achieved. Another medication may also be necessary if metformin is contraindicated or not tolerated. The consensus regarding the second medication added to metformin was to choose either basal insulin or a sulfonylurea.

- Third step is further adjustments. If life-style intervention, metformin, and sulfonylurea or basal insulin do not result in achievement of target glycemia, the next step should be to start, or intensify, insulin therapy. Intensification of insulin therapy usually consists of additional injections that might include a short or rapid-acting insulin given before selected meals to reduce postprandial glucose excursions.
- Proactive Case Management of high-risk Patients With Type 2 Diabetes Mellitus by a Clinical Pharmacist: A Randomized Controlled Trial [3].
 - 80 patients with poorly controlled type 2 diabetes mellitus were recruited for a randomized controlled trial in a university-affiliated primary care internal medicine clinic. A clinical pharmacist provided evaluation and modification of pharmacotherapy, self-management diabetes education, and reinforcement of diabetes complications screening processes through clinic visits and telephone follow-up. Proactive diabetes case management by a pharmacist substantially improved glycemic control and diabetes process-of-care measures. This approach, integrated with and based in the primary care setting, was an effective and efficient approach to improving care, especially for those with poor glycemic control at baseline.

2. MULTIMORBIDITY

- Addressing Medication Management for Older People with Multimorbidities: A Multi-Stakeholder Approach [6].
 - Through semi-structured interviews and focus groups with older adults with multimorbidity and their caregivers, this study found that in developing an app for patients with multimorbidity the app must allow users to create medication lists, learn about their medications, manage changing medications, and support patients in taking medications as prescribed.
- Descriptions of Barriers to Self-Care by Persons with Comorbid Chronic Diseases [1].
 - In free-list semi-structured interviews with 16 patients with 2 or more chronic conditions, this study found that the primary barriers to self-management are compound effect of conditions, physical limitations, compound effect of medications, coordination of medications, burden of medications, side effects of medications, lack of knowledge about conditions, financial constraints, low self-efficacy, burden of the dominant effect of one condition, emotional impact, inadequate communication with providers, need for social support, logistical issues, and the need for better understanding of their conditions.
- The Challenges of Multimorbidity from the Patient Perspective [26].
 - This study compared patients with one chronic illness to patients with multimorbidity through over 400 surveys and focus groups with 60 patients, and found that patients with multimorbidities, compared with patients with a single chronic condition, were more likely to want to learn self-management skills and were more willing to see non-physician professionals to support and enhance their care.
- Prevalence and incidence density rates of chronic comorbidity in type 2 diabetes patients: an exploratory cohort study [21].
 - This was a cohort study of 714 adult patients with newly diagnosed type 2 diabetes within the study period (1985– 2007) in a practice-based research network in the Netherlands. At the time of diabetes diagnosis, 84.6 percent of the patients had one or more chronic comorbid disease of any type, 70.6 percent had one or more discordant comorbid disease, and 48.6 percent and 27.2 percent had three or more chronic comorbid diseases of any type or of discordant only, respectively. A quarter of those without any comorbid disease at the time of their diabetes diagnosis developed at least one comorbid disease in the first year afterwards. Cardiovascular diseases (considered concordant comorbidity) were the most common, but there were also high rates of musculoskeletal and mental disease. Discordant comorbid diseases outnumbered concordant diseases.
- Comorbidity Burden and Health Services Use in Community-Living Older Adults with Diabetes Mellitus: A Retrospective Cohort Study [10].
 - Information was gathered from databases about 448,736 older adults from Ontario, Canada with diabetes describing their conditions and 1-year use of health services, and it was discovered that more than 90 percent of the group had at least 1 comorbid condition and the number of comorbid conditions increased with age of both genders.
- Beyond Comorbidity Counts: How Do Comorbidity Type and Severity Influence Diabetes Patients' Treatment Priorities and Self-Management? [16].
 - This article sought to understand how the number, type, and severity of comorbidities influence diabetes patients' self-management and treatment priorities. Patients with a greater overall number of comorbidities placed lower priority on diabetes and had worse diabetes self-management ability

scores. However, only macrovascular and non-diabetes-related comorbidities, but not microvascular comorbidities, were associated with lower diabetes prioritization, whereas higher numbers of microvascular, macrovascular, and non-diabetes-related conditions were all associated with lower diabetes self-management ability scores. Severe, but not mild, heart failure was associated with lower diabetes prioritization and self-management scores.

- Multimorbidity Due to Diabetes Mellitus and Chronic Kidney Disease and Outcomes in Chronic Heart Failure [7].
 - Findings from this study demonstrate that in patients with chronic heart failure compared with comorbidity due to diabetes alone, multimorbidity due to diabetes and chronic kidney disease was associated with worse prognosis. These findings are important as most patients with heart failure are older adults who suffer from multimorbidity, and diabetes and chronic kidney disease are common comorbidities in these patients.
- Multimorbidity in cohort of patients with type 2 diabetes [34].
 - A cohort of 424 patients with type 2 diabetes enrolled in a cluster randomized controlled trial based in Irish general practice was examined. 90 percent of patients had at least one additional chronic condition and a quarter had four or more additional chronic conditions. 66 percent of patients had hypertension; 25 percent had heart disease; and 16 percent had arthritis. General practitioner visits and polypharmacy increased significantly with increasing numbers of chronic conditions. There was a high prevalence of multimorbidity in these patients with type 2 diabetes and the results suggest that glycaemic control is related to patients' awareness of their chronic conditions.
- The Impact of Comorbid Chronic Conditions on Diabetes Care [30].
 - People with diabetes often struggle with comorbid conditions simultaneously and frequently have other health problems as well. Because there is limited time to address all patient needs, diabetic patients may receive lower quality medical care for discordant conditions. Patients must play a central role in coordinating their own care and need appropriate resources to do so. Information technology, including e-mail and automated telephone calls, can facilitate communication between patients and providers between outpatient encounters and circumvent the time constraints on communication during office visits.
- In surveying 150 individuals with Lyme disease and conducting follow up interviews with 20 patients on their use of the internet in understanding and managing their disease, this study found that most patients looked to prove things they found on multiple online sites, and helped them to better understand their disease and treatment options, especially for those whom the traditional treatment model was unsuccessful.
- Evidence Suggesting that a Chronic Disease Self-Management Program can Improve Health Status while Reducing Hospitalization [20].
 - This study looked at the hospital visits and doctors appointments of 952 patients with one or more chronic conditions, 664 of whom participated in the Chronic Disease Self-Management Program (CDSMP), and found that those in the program increased their levels of exercise and had fewer uses of health care services, which shows that intervention programs such as the CDSMP can help patients improve their quality of life and lead to savings in health care costs.
- Patient Self-Management: A Key to Effectiveness and Efficiency in Care of Chronic Disease [18].
 - This paper discusses the importance of collaborative health care, where the patient is an active partner in their care, as well as the importance of focusing on a patient's holistic outcomes including their physiology, symptoms, physical and emotional function, personal health perceptions, and quality of life.
- Patient Self-Management of Chronic Disease in Primary Care [2].
 - This paper discusses the collaborative care model of treatment, where patients and professionals make decisions together, the importance of allowing patients to define their own problems and participate in goal setting, and the three biggest barriers to incorporating self-management into health care routines which are the lack of trained personnel, the current medical model which fosters patients' dependence on their physicians, and the lack of funds for self-management education.
- Patients' perceived barriers to active self-management of chronic conditions [13].
 - This study conducted 10 focus groups with 54 participants, most of whom had multiple chronic conditions, and found that the major barriers to self-management were pain, financial problems, lack of family and physician support, and lack of awareness. It also found that the use of a home based self-efficacy program (such as a home version of the CDSMP) would reduce several of the factors limiting personal health care management, including depression, physical symptoms, lack of family support, access to resources, cost, and transportation.

3. SELF-MANAGEMENT

- Competing Online Viewpoints and Models of Chronic Illnesses [22].

- Self-Management Education: History, Definition, Outcomes, and Mechanisms [19].

- This paper separates self-management into three components: medical management of a condition, maintaining and creating new meaningful behaviors or life roles, and dealing with the emotions of having a chronic condition which alters one's view of the future. It also discusses the importance of basing self-management programs on patient perceived problems and on helping them to develop skills such as problem solving, decision making, resource utilization, taking action, and forming a patient/health care provider partnership.

- Effectiveness of Self-Management Training in Type 2 Diabetes: A systematic review of randomized controlled trials [27].

- The purpose of this article is to systematically review the effectiveness of self-management training in type 2 diabetes. A total of 72 studies described in 84 articles were collected, and positive effects of self-management training on knowledge, frequency and accuracy of self-monitoring of blood glucose, self-reported dietary habits, and glycemic control were demonstrated in studies with short follow-up. Effects of interventions on lipids, physical activity, weight, and blood pressure were variable. With longer follow-up, interventions that used regular reinforcement throughout follow-up were sometimes effective in improving glycemic control. Educational interventions that involved patient collaboration may be more effective than didactic interventions in improving glycemic control, weight, and lipid profiles.

- Integrating Medical Management With Diabetes Self-Management Training [31].

- Patients with type 1 and type 2 diabetes in poor glycemic control were randomly assigned to the Diabetes Outpatient Intensive Treatment (DOIT) or a second condition, entitled EDUPOST, which was standard diabetes care with the addition of quarterly educational mailings. A total of 167 patients (78 EDUPOST, 89 DOIT) completed all baseline measures, including A1c and a questionnaire assessing diabetes-related self-care behaviors. At 6 months, 117 patients (52 EDUPOST, 65 DOIT) returned to complete a follow-up A1c and the identical self-care questionnaire. At follow-up, DOIT evidenced a significantly greater drop in A1c than EDUPOST. DOIT patients also reported significantly more frequent blood glucose monitoring and greater attention to carbohydrate and fat contents of food compared with EDUPOST patients. An increase in attention to carbohydrate and fat contents over the 6-month period was associated with improved glycemic control among DOIT patients.

- National Standards for Diabetes Self-Management Education [8].

- Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviors, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life.

4. MEDICATION MANAGEMENT AND ADHERENCE

- Medication Adherence: Emerging Use of Technology [9].

- This paper evaluated other studies and determined that the integration of in-person contacts with technology based medication adherence reminders, electronic medication trackers, and pharmaceutical databases can improve medication adherence and have a positive effect of patient outcomes.

- Older Adults with Multi-Morbidity: Medication Management Processes and Design Implications for Personal Health Applications [11].

- This study conducted focus groups and semi-structured interviews with adults over 65 with multimorbidities and found that the key concerns to medication self-management are seeking reliable medication information, maintaining autonomy in medication treatment decisions, polypharmacy, dealing with discrepancies between traditional and Alternative medical therapies, and coordinating medication lists and health records between multiple providers and health care networks.

- A Systematic Review of Adherence With Medications for Diabetes [5].

- A literature search was performed to identify reports with quantitative data on adherence with oral hypoglycemic agents (OHAs) and insulin and correlations between adherence rates and glycemic control. Adequate documentation of adherence was found in 15 retrospective studies of OHA prescription refill rates, 5 prospective electronic monitoring OHA studies, and 3 retrospective insulin studies. Retrospective analyses of the documentation confirms that many patients for whom diabetes medication was prescribed were poor compliers with treatment, including both OHAs and insulin. However, electronic monitoring systems were useful in improving adherence for individual patients. Similar electronic monitoring systems for insulin administration could help healthcare providers determine patients needing additional support.

- Clinical outcomes of patients with diabetes mellitus receiving medication management by pharmacists in an urban private physician practice [25].

- The clinical outcomes of patients with diabetes mellitus in an urban environment receiving pharmacist medication management in collaboration with private-practice physicians were assessed. Data were collected at three junctures: six months before the first visit with the pharmacist, on the date of clinic entry, and six months after the first clinic visit. Primary outcomes analyzed were glycosylated hemoglobin, weight, and blood pressure. Secondary outcomes analyzed were smoking cessation and initiation of aspirin, angiotensin-converting-enzyme inhibitor, or angiotensin receptor blocker therapy. Integrating a pharmacist into a private physician practice significantly improved patient glycemic control and maintained patients’ weight and the number of patients at blood pressure goal. Clinic adherence with the American Diabetes Association recommendations was sustained.
- Relationship of Depression and Diabetes Self-Care, Medication Adherence, and Preventive Care [17].
 - In a large health maintenance organization, 4,463 patients with diabetes completed a questionnaire assessing self-care, diabetes monitoring, and depression in order to assess whether diabetes self-care, medication adherence, and use of preventive services were associated with depressive illness. Automated diagnostic, laboratory, and pharmacy data were used to assess glycemic control, medication adherence, and preventive services. Major depression was associated with less physical activity, unhealthy diet, and lower adherence to oral hypoglycemic, antihypertensive, and lipid-lowering medications. In contrast, preventive care of diabetes, including home-glucose tests, foot checks, screening for microalbuminuria, and retinopathy was similar among depressed and nondepressed patients.

5. MOBILE APPLICATIONS AND TECHNOLOGY

- Colorado Care Tablet: The design of an interoperable Personal Health Application to help older adults with multimorbidity manage their medications [32].
 - This study focused on the development of the Colorado Care Tablet, a personal health app designed for older adults with multimorbidity, and found that older adults prefer linear instructions and design, a simple interface, pictures of their medications, and the ability to customize the app slightly to suit their individual needs, as a “one size fits all” app is less likely to be adopted by older adults.
- ConCap: Designing to Empower Individual Reflection on Chronic Conditions using Mobile Apps [28].
 - This study asked 12 patients with diabetes to use ConCap, an application designed to log glucose scores and take photographs, for a month. The study found that for individuals who were facing changes in their daily routines or who experienced high fluctuations that the ability to log and correlate glucose scores and daily activities was useful in developing health habits and understanding their scores, but the app was unhelpful for stable individuals who found logging data to be time consuming.
- How Can eHealth Technology Address Challenges Related to Multimorbidity? Perspectives from Patients with Multiple Chronic Conditions [35].
 - In 10 focus groups of 53 participants with multiple chronic conditions, this study found that the main issues faced by patients were managing a high volume of information, coordinating and synthesizing information from different providers about different conditions, and needing to serve as their own experts and advocates because of their unique combination of health issues. It also found that patients desired a mobile application with easy access to their medical records, help identifying medication interactions, help with common self-management challenges, integration of information across health care systems, aid facilitating communication with multiple providers, and access to online support networks.
- How People Use Smartphone Apps to Manage Long Term Conditions [12].
 - This study conducted interviews with 15 participants, who demonstrated their use of diabetes apps to manage their conditions, and found that patients did not spend a lot of time selecting an app to use, only used the features that were beneficial to them, and interpreted the data in a personal, rather than a clinically based, manner.
- Investigating the Viability of Automated, Intuitive, and Contextual Insights for Chronic Disease Self-Management Using Ubiquitous Computing Technologies [14].
 - This paper outlined the expected results of a study working with patients with Type 1 Diabetes to develop a mobile app, which will minimize the amount of data logged by individuals to encourage long-term adoption, help users focus on potential future actions, and incorporating helpful and individualized lifestyle suggestions.
- Mobile Apps for IBD self-management using wearable devices and sensors [29].
 - This paper explored how wearable sensors and connected mobile apps could help patients manage their diseases by easily capturing clear statistics, which would empower patients to take an active role in disease management and consistently interpret their medical information.
- Motivating People with Chronic Pain to do Physical Activity: Opportunities for Technology Design [33].

- This study worked with both patients with chronic pain and their health care providers to understand how they maintained physical activity in their daily lives and how pain-specialist physiotherapists supported these patients. They found that it was important to define exercise as a journey, and that any technology used should help shape and learn skills as well as provide adequate support and reassurance while still allowing the patient to control the process.

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