Research Article

Maccabi Integrated Care 360^0 - A Holistic, Multidisciplinary Care Model for Complex Patient

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Abstract

Background: While massive efforts are invested in chronic populations the outcomes are only partly satisfactory. The management and control of multiple chronic conditions requires comprehensive solutions. Maccabi Health Care Services, 2nd HMO in Israel, developed a multi-dimensional solution for complex patients that combines a conceptual, technological and treatment model. In this paper we present Integration 360^0 - Maccabi Integrated Care (MIC) program. Using quasi-experimental methods we compare the effects of the MIC 360^{0}on complex patients recruited in 2019 to similar patients in MHS registry.

Methods: Potential cohort is derived from a matrix including the following parameters: age 50+, chronic diseases, multiple/high risk drugs, cognitive decline, function level, socioeconomic status (SES) and annual expenditure. Potential target population include about 19,000 patients scoring 5 - 10 in complexity score. MIC patients are recruited by primary physician. Control patients are matched through propensity score based on based on sex, age and complexity score. Outcomes of MIC vs. control were assessed comparing the following 6-months outcomes to the corresponding pre-entrance period for each MIC patient: care providers visits and average monthly costs.

Results: The analysis included 241 matched pairs (MIC vs. control) of complex patients. Comparing the MIC patients' visits to care providers to matched control group prior and following the intervention we found the average number of visits to nurse, social worker and nutritionist increased significantly while among matched control patients the average number of visits to primary physician and nurse decreased significantly. Finally, we found a 20% decrease in overall monthly costs in MIC patients compared to a 8% decrease in control patients with hospitalization cost being the main contributor to this cost reduction (-54% in MIC vs. 2% in control, p < 0.05).

Conclusion: MIC 360^0 is a viable, sustainable and practical program. Our findings show that the implementation of the integrated model results in more visits to multidisciplinary care providers and that the program is cost saving. Furthermore, the initiative is transferable. This model or alike should be implemented in almost any community care setting with the dominance of primary care physicians.

Keywords: Complex Patients; Integrated Care; Complexity Score; Technological Platform

Abbreviations

MIC: Maccabi Integrated Care; MHS: Maccabi HealthCare Services

Introduction

Population aging and the increasing rates of chronic diseases pose a great burden on health systems. The increase in multiple chronic conditions is a major driver of healthcare costs [1]. The management and control of multiple morbidities/multimorbidity is a complicated challenge; massive efforts are invested in chronic populations though the outcomes are only partly satisfactory [2].

One-fourth of all adult Americans have one or more chronic conditions, but these people account for about two-thirds of health

care spending [3]. In Israel one third of adult population (30 - 60) has at least one condition [4].

Complex patients comprise patients with multiple care needs who are served by multiple providers, who have several comorbidities, and who are possibly vulnerable [5]. These patients are often described as high need, high cost patients [3].

Traditional primary care services are not well adapted to attend to complex patients' needs.

Moreover, medical complexity frequently involves economic and social issues that are often ignored in traditional care perspective [6].

Addressing both medical and social needs requires a holistic perception and dictate an integrative approach. Integration of care across providers, settings and sectors is essential for the coordination across providers in health and social sector. Thus, applying integrated complex care models may contribute to the provision of effective care [3].

This paper presents Maccabi Integrated Care program - Integration 360⁰ (MIC 360⁰).

In this observational study we use quasi-experimental methods to compare the effects of the MIC 360⁰on complex patients recruited in 2019 to similar patients in MHS registry.

Maccabi integrated care 360⁰

Maccabi Healthcare Services (MHS), a large HMO (payer-provider) with over 2.1 million members in Israel. MHS represents 25% of the population nationwide, in a context of universal and mandatory health coverage via four recognized health plans. MHS data show that among the population aged 50 and older, 62.5% have one or more chronic disease [7]. Based on this data Maccabi Integrated Care (MIC) 360⁰ was built.

A multi-dimensional model was developed combining a conceptual shift, technological platform and a treatment model. Conceptually, we designed a perception shift from fragmentation to integration. The patient is perceived as a whole - his/her complete health is considered referring to health, social and economic welfare. The care plan is tailored according to patient's needs and is

integrative in nature. Care plan is based on collaboration of health and social services along with community mapping for optimal use and geographic adjustment of community resources.

The integration 360⁰ is based on proactive approach, Chronic Care Model (CCM) and continuity of care. According to the treatment model the primary physician is the case manager with a supportive multidisciplinary team of integrative nurse, social worker, service coordinator, nutritionist and physiotherapist.

Target population and complexity score

The target population is "complex patients" - chronic, high need, high cost patients.

Potential cohort is derived from a matrix including the following parameters: age 50+, chronic diseases, multiple drugs, high risk drugs, cognitive decline, function level, socioeconomic status (SES) and annual expenditure per patient. Each patient receives a score according to the weighting of the components. The scale ranges from 0 - 19 when the target population for intervention was defined as having a score of 5 - 10.

The potential target population is about 20,000 patients with a score of 5 - 10.

The pilot began in December 2017 and includes five active regions with 500 patients for whom a care plan has been adapted.

Technological platform

MHS has developed a platform including: Identification and stratification population, registrars, clinical and social parameters. Moreover, the technology infrastructure includes an operational system for communication between care providers, BI systems, a system for mapping and presenting services (health, welfare, non-profit organizations, etc.) (GIS) as well as BIG DATA, based on the diagnosis and sequence of information in the electronic medical record.

Treatment model

In order to achieve the patient's overall well-being, a treatment plan must be built that addresses the full range of needs in the eyes of the patient, the attending physician and other care providers - 360⁰ view. Primary physician is the Case Manager who construct the care plan. Integrated team at regional facilities work together

to address patients' needs. Patient is empowered and activated to self-management, better adherence and healthy life style. Integration between several providers and services is led by integrative nurse and supported by multi-disciplinary team work and digital platform.

Integrated team includes: Integrative nurse who is responsible to the application of the care plan and the achievement of the treatment objectives. Social worker assesses the social needs and insurance rights of the patient and intervenes accordingly to improve adherence, coping strategies and adaptation. Service coordinator activates the patient's rights actualization and progress the administrative aspects of the care plan. Nutritionist assesses patient's dietary needs and intervenes through nutritional solutions which are integrated to the care plan. Physical Therapist treats patients with functional disabilities. Finally, pharmacist virtually consults the primary physician is regarding medication regimen adaptation.

Figure 1: Maccabi integrated care 360^0 model.

Treatment model
Data

Large computerized database gathers and stores information on all MHS members.

The database includes physician diagnoses, dispensed medications, consultations, hospitalizations, procedures, and individual socio-demographic data. Patients' data involves comorbidities, hospitalizations, ER visits, physician visits, specialist visits, medications consumption and laboratory test results.

Methods
Study population

About 19,000 patients older than 50 and a complexity score of 5 - 10 were chosen with a cost exceeding 25,000 NIS in the past two years.

Patients without a documented complexity score on the same month of entering the program (study group) or same month of being chosen as fitting to the program but without being treated (control group) were excluded.

Study variables and measurement

Data were collected on the complexity score for each patient as well as demographic data. Additionally we calculate the average cost consists of: Cost of hospitalization, Cost of using private institute, Cost of Lab test, Cost of using Maccabi institute, Cost of Medication, Cost of Doctor visit, Cost of Other.

Statistical analyses

Outcomes of MIC were assessed comparing the following 6-months outcomes to the corresponding pre-entrance period for each MIC patient: service utilization and average monthly costs.

Descriptive statistics was calculated and presented as n, % or mean ± SD or median (interquartile range), as appropriate. Comparisons of proportions and means across groups will be done using Chi-square test, Wilcox and Student's t-test, respectively.

Patient's entry to MIC is under the decision of primary physician. Enrolled patients are therefore not necessarily comparable to unenrolled candidates. Hence, propensity score matching (PSM) method was applied for the assessment of the differences between MIC and control patients.

To match control patients to MIC enrollees, a logistic regression model was applied to calculate the probability of MIC enrollment based on sex, age and complexity score. Outcomes of propensity-matched control patients were retrieved from the relevant disease registries and organizational costs databases. Average monthly

costs during the 6 months prior to entrance were also used in the propensity score matching for the economic assessment. -Costs were used only after the match, they weren't taken in consideration while calculating the match.

Results

The intervention group included 241 patients scored between 5 - 10 in complexity score who were enrolled to MIC during 2019. Potential pool comprised unenrolled candidates (also scored 5 - 10) from which control group was obtained based on a propensity score algorithm.

The analysis thus included 241 matched pairs of complex patients.

Table 1 presents profiles of the study sample and their matched controls.

The study sample was sexually equal, average age 69 and average complexity score of 7.5.

Most of the patients had hypertension, a quarter had cancer and few approximately one in ten had neurological condition or COPD. At most, comorbidities distributed equally between groups besides cardiac condition that was more prevalent in MIC group.

Variable	MIC/Integrated Care	Matched Controls	p-value
Patients	241	241	
% Male	123 (51)	124 (51.5)	NS
Age mean (s.d.)	69.0 (7.5)	68.8 (6.4)	NS
Complexity Score mean (s.d.)	7.5 (2.0)	7.3 (1.7)	NS
% Hypertension	181 (75.1)	184 (76.3)	NS
% CVA/TIA	23 (9.6)	24 (10)	NS
% Cardiac condition	105 (43.6)	78 (32.4)	0.001
% COPD	24 (10.0)	15 (6.2)	NS
% Cancer	54 (22.4)	61 (25.3)	NS

Table 1: Profile of complex patients, 2019.

Care providers visits

Table 2 presents average monthly utilization data comparing the MIC and the matched control group in the 6 months preceding and following the intervention.

Among MIC patients no pre-post change was seen in average number of visits to primary physician and physiotherapist. However, the average number of visits to nurse, social worker and nutritionist increased significantly.

Among matched control patients the average number of visits to primary physician and nurse decreased significantly while the average number of visits to other care providers did not change.

Variable	Pre-intervention	Post-intervention	p-value
Patients	241	241	
Primary Physician			
MIC	8.6 (6.2)	8.1 (5.2)	NS
Control	9.1 (5.2)	7.4 (4.1)	<0.001
Nurse			
MIC	2.4 (3.3)	3.1 (4)	<0.05
Control	2.7 (3.2)	1.7 (2.6)	<0.001
Physiotherapist			
MIC	1.7 (5.2)	1.8 (3.9)	NS
Control	2.4 (5.0)	2.1 (4.9)	NS
Social worker			
MIC	0.3 (1)	1 (1.7)	<0.001
Control	0.2 (0.9)	0.1 (0.8)	NS
Nutritionist			
MIC	0.4 (1.3)	1 (1.5)	<0.001
Control	0.4 (1.3)	0.4 (1.2)	NS

Table 2: Care providers visits.

Monthly cost

Figure 2 shows the change in average monthly cost of MIC and control patients in the first 6 months of the intervention period compared to the preceding 6 month period. Findings show a 20% decrease in overall monthly costs in MIC patients in contrast to a 8% decrease in control patients. Furthermore, a significant de-

Figure 2: Percent change in average cots by costs components.

crease was found in hospitalization cost (-54% in MIC vs. 2% in control, $p < 0.05$). Medication costs increased in MIC patients (26% in MIC vs. -3% in control, $p < 0.05$). Clinic visits - either primary physician or private clinic - did not reveal significant change.

Discussion

The current paper introduces the rationale, operations and implementation of MIC 3600 - an integrated, multidisciplinary team care model for complex patients. Due to the sizeable number of patients included in the care model the assessment involved quasi experimental design.

The effect of MIC on complex patients was examined in assessing it's outcomes compared to matched control patients.

We found a significant benefit to complex patients, specifically a decrease in hospitalizations and overall costs.

Multiple chronic morbidity dictates high demand for health services from one side and the development of supply of care providers and services. The abundance of services is beneficial to the patient but in practice there is flooding and duplication that may lead to confusion and disorientation. Fragmented care was not adequate to patient's needs. Thus, integrated care models have emerged due to multimorbidity's and their patchy response.

In recent years, the health systems in the Western world have been engaged in proper preparedness to reduce the burden of treating multiple and complex illnesses. Appropriate preparation may be based on community-based care, with close coordination and cooperation between the hospital, community and welfare

systems [8,9].

Our role as a health organization is to create congruence between what the patient wants and what the patient needs in different aspects of his life - physical, mental and social. In other words, our goal is to give the right patient the right treatment along the continuum in 3600.

Our goal is providing a holistic adapted care to high need, high cost patients.

We spotted a "neglected" population which is characterized high service consumption on the one hand and not adequately treated on the other. We inquired over this population's needs and found out that health is only part of the problem and that we cannot treat the health problem regardless of the social or economic problems. Thus, the treatment solution dictates an integrative approach.

Beyond the conceptual shift we designed a treatment model based on proactive approach, CCM and continuity of care. According to the treatment model the primary physician is the case manager with a supportive multidisciplinary team of integrative nurse, social worker, service coordinator, nutritionist and physiotherapist.

Assessing the treatment model we found that MIC patients increased visits to social worker and nutritionist while control patients decreased visits to primary physician and nurse.

It seems that the treatment model maintained the number of visits with the main care providers (primary physician/nurse) at the same level. Moreover, the MIC might have prevented a decrease in these visits as was seen in control patients.

Yet, the implementation of MIC increased the visits to social workers and nutritionists compared to no change in control patients, thus displaying the application of the multidisciplinary team work. Furthermore, this finding expose the benefit of the integrated care plan. A recent paper presents the "ECHO care" providing videoconferencing sessions with multidisciplinary specialists regarding 427 complex patients. The authors conclude that multidisciplinary expertise support primary care providers in the management of complex patients [3].

A major element in MIC model regards the technological platform.

This includes: Identification and population stratification (registrars, SES, medication consumption, cognitive status, functional status and baseline treatment costs).

In addition, the technology infrastructure includes an operational system for communication between care providers, BI systems that enable an organizational infrastructure for gathering information from the patient, a system for mapping and presenting services (health, welfare, non-profit organizations, etc.) (GIS) as well as BIG DATA, based on the diagnosis and sequence of information in the medical file.

Maruthappu, Hasan and Zeltner [2] assert that integration of care involves an understanding of patients' needs as well as enabling access to such information by multiple care providers. This data - retrieved from electronic health records - should be available, uniform, and coordinated and accessible by all care providers. This kind of technological infrastructure would allow for efficient patient management [2].

Various integrated programs apply technological means in their interventions. The "ECHO care", for example, used videoconferencing sessions to connect multidisciplinary specialists with primary care providers [3].

MIC offers a more advanced care than standard primary care. The implementation of the treatment model requires the investment of organizational resources. Since MHS is a non-profit HMO savings in management of one population enable more advanced care to other population. Hence the free of charge nature of the service, the financial aspects of its operation are important to its sustainability. Thus, the reduced hospital costs during the intervention found in this study is a positive indicator for affordability.

This quasi-experimental study had several limitations. First, it is based on a convenience sample of patients and therefore does not necessarily represent the general population of complex patients. Second, the entrance to MIC was due to the decision of primary physician which might have created a bias. Finally, control patients were matched through propensity score method thus creating a relatively balanced sample groups though MIC patient had more cardiac conditions.

Future studies may improve the sampling phase by matching prospectively control patient to each MIC one. Moreover, an expansion of the follow up span on patients from 6 months to 12 months in would be beneficial to reveal the long term effects of the intervention.

Conclusion

In this paper we present the implementation of an integrated care model which is viable, sustainable and practical. MHS has developed a multi-dimensional model that combines perception shift, technology and treatment model.

Conceptually, the integrative approach emphasizes people-centered health systems and meet the multidimensional needs of the population and the individual for the improvement of their health outcomes (WHO, 2016). Technological platform includes identification and population management system, an operational system for task management and communication between providers.

BI systems, GIS and electronic medical record. Integrated model structures the connectivity and cooperation within multidisciplinary team; Primary physician as case manager, nurse as a coordinator, administrator, social worker, nutritionist, physiotherapist and pharmacist.

Assessment of MIC shows the enhancement of multidisciplinary team work through the increase of visits to social workers and nutritionists. Outcomes also involve overall cost reduction as well as hospitalization decrease indicating MIC sustainability and affordability.

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