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An Observational Study

Reducing Hospitalization and Cost for Medicare Beneficiaries with Heart Failure

Original Investigation

Reducing Hospitalization and Cost for Medicare Beneficiaries with Heart Failure through a Digital Health Solution

An Observational Study

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BACKGROUND
Heart failure remains a large burden in terms of mortality and costs, and telehealth interventions can help care managers by providing remote patient monitoring (RPM) and automated digital coaching to supplement traditional face-to-face, in-person care.

OBJECTIVES
To assess the impact of integrating a remote monitoring program for patients with heart failure into existing patient-provider interactions and to measure whether the program impacted all-cause admissions and total costs.

DESIGN
Retrospective analysis of a non-randomized intervention cohort with a propensity matched observational control arm.

PARTICIPANTS
Adult patients with stage II or higher heart failure enrolled in Medicare Advantage insurance programs with an Optum risk score greater than 10, managed by an Independent Practice Association.

INTERVENTION
Remote home monitoring program including biometric measurements, automated coaching for self-care, and automated monitoring surveys delivered via telephonic interactive voice response.

MAIN MEASURES
Hospital admissions (per 1000 patients per year), total healthcare costs, return-on-investment (ROI) measured as the total cost difference divided by cost of implementing program, and change in blood pressure (for hypertensive intervention patients only).

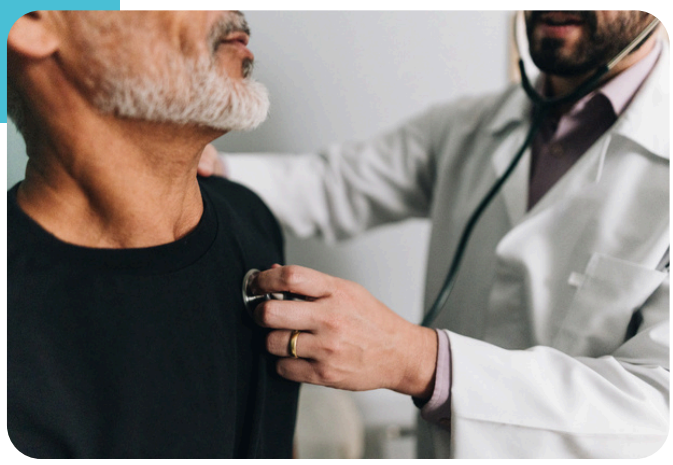
KEY RESULTS
Patients had significantly fewer hospitalizations than expected (-134 per 1000 patients per year, 95% CI=-198 to -73, $p<0.001$) and lower costs resulting in a significant ROI (2.68, 95% CI = 1.17 to 5.08, $p=0.005$). A subgroup of higher-risk patients showed even greater reductions in admissions and cost. Patients with hypertension at baseline showed average reductions of -15mmHg and -10mmHg in systolic and diastolic pressures, respectively.

CONCLUSIONS
These results support the efficacy of a consistent, well-defined approach to acting on information generated by remote monitoring processes to mitigate the exacerbations of heart failure in a timely, impactful way to reduce admissions and costs and improve outcomes.

Introduction

Heart failure remains one of the largest burdens in the US, both in terms of mortality and costs of treatment, affecting over an estimated 6.5 million individuals over the age of 20. It remains the most common reason for hospitalization among Medicare members[1,2], costing more than $30 billion annually, of which 68% is attributable to direct medical care. Those costs are projected to increase to over $70 billion by 2030 as prevalence is expected to increase by 46% in that timeframe[3].

For professional care managers, heart failure remains achallenge, in part due to the disease literacy required by patients and caregivers to properly self-manage and the potential for pre-acute physiological factors (e.g., thoracic fluid retention) to escalate in a short time such that home interventions (e.g., diuresis) are no longer sufficient, and costly, urgent hospital intervention is the only option.



Timely intervention to avoid these urgent care episodes requires disease education, coaching, and heightened vigilance by care managers who are often overtaxed with large caseloads. Telehealth interventions, such as remote patient monitoring (RPM) and automated digital coaching, can support care managers by alerting them to pre-acute symptoms while delivering focused, automated health education to patients to supplement intermittent live coaching. The wide heterogeneity of platforms and approaches to telehealth interventions has limited the generalizability of the existing literature, which has included both randomized controlled trials (RCTs) and retrospective studies supporting reductions in all-cause mortality[4,5,6,7,8], hospitalizations[4,6,7,8,9,10,11,12,13,14,15,16,17], emergency department (ED) utilization[9,15,18] and costs[16,19,20,21,22,23]. Several gaps remain in the literature and warrant further exploration, however, particularly related to the process by which remote patient monitoring data support clinical decision making by care team members, and how information can be acted upon in real-world clinical practice, across clinical settings and different centers of clinical accountability. Furthermore, few studies have investigated direct return-on-investment (ROI) for telehealth interventions, or studied at-risk candidates, or measured biometric improvements concurrently with utilization and financial outcomes.

A large, regional IPA is a developer and manager of provider networks and are at risk for the costs and clinical outcomes of their patient populations through risk contracts with different insurers, and it co-designed a heart failure remote monitoring program with AMC Health, a telehealth vendor and facilitator of virtual care programs. The implementation of this program assumed that the remote monitoring intervention must be driven by an agreed-on process that governs who bears the responsibility for the clinical response to information and alerts, and must be applied through a unified approach to remote patient management using a consistent workflow across large populations of patients to maximize

generalizability of findings. The purpose of this retrospective study was to assess the efficacy of inserting the remote monitoring program into existing patient-provider interactions on a large scale—without having to hire additional clinic staff, disrupt existing practice workflows or re-engineer the way that providers practice—and to measure whether the heightened surveillance and subsequent interaction with patients by remote care managers impacted all-cause admission rates and total costs, including the ROI derived from any cost savings. A secondary analysis also examined blood pressure management for the subset of enrollees who were hypertensive at baseline.

Description of the Telehealth Intervention

Patients were identified for the telehealth intervention via the IPA's claims database, and had to be greater than 18 years of age, enrolled in a Medicare Advantage insurance program, with a documented diagnosis of heart failure (stage II or higher), and with an Optum 12-month risk score >10. The Optum score is a proprietary methodology derived from age, gender and mix of predetermined weights associated with episode risk groups and other custom markers.

Patients were excluded from the telehealth intervention if they were documented as living in a custodial nursing care setting or had select diagnoses that would interfere with the remote monitoring process or qualify the patient for a separate, intensive case management tract under other programs (e.g., schizophrenia and other psychotic or dissociative disorders, end-stage kidney disease, brain damage, coma, paralysis, documented substance abuse).

All candidates were mailed a letter explaining the objectives and benefits of the remote home monitoring program, followed by a screening phone call to determine level of interest, confirm no cognitive or functional limitations, and to gain informed consent. Enrolled patients received a telemonitoring kit (AMC Health, New York, NY) that included a Bluetooth-enabled digital weight scale, blood pressure monitor, and cellular modem to collect device measurement data, via Bluetooth, and transmit to a secure web portal, in near-real-time. After delivery of the kit, patients received another call from the telehealth vendor's engagement specialist to walk through the device's use, confirm transmission of initial readings, and to introduce the primary nurse care manager (provided by the telehealth vendor) who would perform an initiating comprehensive assessment.

Following the initial assessment (which could involve medication reconciliation), if biometric readings from the monitoring equipment formed a pattern of concern, an alert was posted to the web dashboard for review by the patient's care team. It was the primary nurse telecare manager's responsibility to triage these daily alerts, assess biometric,

symptom and behavioral patterns of concern, and provide proactive education and clinical intervention when warranted. Telecare managers also routinely connected with the providers, as appropriate, when further assessments, or a change in medical management, were required. They coached patients prior to scheduled appointments (with a copy of the patient's biometric report faxed to the provider in advance), to help the patients maximize benefit of the encounter, and followed up afterward to confirm any new prescriptions or changes in management, answer any questions, and reinforce the provider's plan of care. The telecare managers also followed up after any ED encounter or hospitalization to assist in transitions-of-care, and to support any modifications to the plan of care following the event. The primary telecare manager was also able to involve other care team members at strategic times, as needed, including certified diabetic educators, clinical social workers and pharmacy technicians (also provided by the telehealth vendor), each of whom provided supplemental coaching for limited periods of time. Monthly summary reports on biometric patterns and other events were sent to providers for all enrollees, regardless of whether biometric or survey alerts were generated during that time.

Upon enrollment, patients are also assigned automated, interactive surveys delivered via telephonic interactive voice response (IVR). These surveys employed branching logic to solicit patient self-reported data on symptom, behavior, environment, and access to care. Patient answers to these questions could also generate alerts to the dashboard, and some surveys were designed to be triggered by a biometric alert value detected by the dashboard (e.g., "We received your blood pressure readings and they have been high for you. We'd like to ask you some questions to make sure you are ok…"). Other surveys were regularly scheduled to collect routine information while imparting focused health education on the patient's condition.

Disenrollment from the program was voluntary at any time, but patients automatically qualified for graduation from the program following a three-month period of stable readings provioded there had been no serious adverse events such ED encounters and unplanned hospitalizations during that time.

Methods

This was a retrospective quality review employing a pre-post parallel study design comparing patients recruited into the telehealth intervention group with a concurrent control – identified through propensity score matching - who did not receive the intervention.

Statistical Analysis

The analysis of outcomes used the IPA's claims database for utilization and cost data, and blood pressure data provided by AMC Health. Cost data were compiled after a 3-month claims adjudication period following the end of the study period. All claims costs were included in the analysis, including Medicare Part A & B utilization, lab and pharmacy claims. In addition to the intervention cohort, who were enrolled between January 1, 2016 and December 31, 2017, a matched control cohort was also identified from the pool of candidates who were contacted about enrollment during the same time period but who did not enroll. An index date was defined for each patient as either the date when they enrolled (intervention patients) or the date when they were contacted for enrollment but did not enroll control patients. A propensity score (PS) (i.e., propensity for being enrolled) was estimated for each patient based on the month of index date, Optum risk score, and the patient's total cost (average per month) in the 12 months prior to enrollment date. A greedy matching algorithm and 1:1 ratio was used to match each intervention patient with 1 control patient with the nearest PS within a caliper of 0.2 times the standard deviation of propensity scores. The pre-intervention period was defined as the 1 year prior to index date, and the post-intervention period was defined as the 1 year after index date or the time between the index date and June 30, 2018, whichever came first.

After matching, a difference-in-difference (DID) calculation was used to evaluate the impact of the intervention on hospitalizations and total healthcare cost as compared to the control group, with 10,000 replications of nonparametric bootstrapping to construct 95% confidence intervals and p-values in each case. Return on investment (ROI), including mean and 95% confidence interval, was then calculated as the difference-in-difference of total costs (summed over the time period) between the intervention and control cohorts, divided by total cost of the telehealth program implementation. Within the intervention cohort only, we also examined the patients whose systolic or diastolic blood pressures were defined as hypertensive by JNC8 guidelines, and used data from the telehealth monitoring to examine improvements in blood pressure control. A secondary analysis of hospitalizations and ROI was also performed using only the high-risk program enrollees with a risk score of 20 or greater at the time of referral and their matched controls. All statistical analysis was performed using R software (The R Group, Vienna, Austria) with contrasts of $p<0.05$ considered statistically significant.

Results

Table 1 shows the baseline characteristics of patients in the intervention and control groups, before and after propensity score matching. The mean length of time in the intervention was 11 months. Overall, intervention and control patients had an average age of 77 years, were 46% male, had an average Optum risk score of 19.9, an average 12-month prior expenditure of $1,094 per month for the intervention group and $943 for the control group. After propensity matching, 65 intervention patients were excluded from the analysis due to insufficient matches, leaving 1,719 intervention patients matched to 1,719 controls. 635 of these were categorized as high-risk at baseline with an Optum risk score ≥20.

Patients in the intervention group had significantly fewer hospitalizations per year than expected based on the control group (-134 per 1000 patients per year, 95% confidence interval = -198 to -73, p<0.0001) in the post-intervention period, and significantly lower total costs resulting in an estimated ROI of 2.68 (95% confidence interval = 1.17 to 5.08, p=0.005) (Table 2). In the subgroup analysis of only those patients with high risk scores at baseline (≥20), the reduction in hospitalizations was even greater (-157 per 1000 patients per year, 95% CI = -265 to -53, p=0.003) and the estimated ROI was even higher (4.60, 95% CI = 1.84 to 8.20, p=0.004).

For the 1,719 intervention patients, baseline blood pressure averages were determined by averaging the first 10 days of readings following start of monitoring (even if this began prior to the study period). End-of-period blood pressure averages were determined by averaging each patient's blood pressure readings in the last 10-days of the study period (or in the patient's last 10 days on monitoring if disenrolled prior to the end of the study period). Of the 1,719 intervention patients (Table 3), 500 were systolically hypertensive at baseline per JNC8 standards. Of these 500 patients, 80% had improvement in average systolic blood pressure from the beginning to end of the period, with 55% meeting JNC8 guidelines by the end. Of the 1,719 enrollees, 97 were diastolically hypertensive at baseline. Of these 97, 84% had improvement in average diastolic blood pressure from the beginning to end of the period, with 60% meeting JNC8 guidelines by the end.

Discussion

The findings support predicate studies that suggest remote monitoring interventions can positively affect hospitalizations and overall ROI. They also support the efficacy of remote monitoring interventions in hypertension management.

If the telemonitoring intervention was indeed effective in reducing all-cause hospitalizations, both those direct hospitalization costs and all associated post-hospitalization utilization (such as post-hospital rehabilitation in skilled nursing facilities, skilled home care and other ambulatory care related to the hospitalization) would also be affected. The associated cost savings from just these events could explain the difference in cost savings and subsequent ROI. It's also intuitive that these effects would be amplified for the high-risk subset who are expected to end up in the hospital with greater frequency. The hypothesis is that by having a consistent, structured process to respond to remote monitoring data resulted in more timely responses to pre-acute decompensation of patients with heart failure that would otherwise have led to a hospitalization event. This may include nurse instructions to increase a diuretic at the right time, or that the patient requires further evaluation through a provider office visit. It may also include focused health coaching on diet and medication adherence at the earliest sign of biometric or patient self-reported data suggesting the patient is drifting away from adherence to the provider's plan of care.

As the control cohort did not receive any telemonitoring for blood pressure, it's impossible to determine the correlation between remote monitoring and the reduction in hypertension, but it is intuitive that the surveillance of near daily blood pressures, taken at home, on the same device, for an average of 11 months, carries the advantage of being alerted not only to individually high (or low) readings but to intra- and inter-day patterns of concern at the earliest opportunity and be able to associate those patterns to other symptoms and to patient behavior (such as medication adherence and diet). Thus, a combination of early detection and the ability to coach patients, linking symptomatic causes to effects, should serve as an effective strategy not just for hypertension management, but for mitigating the exacerbations of heart failure and other comorbidities.

Although these telehealth programs have been employed for the past 15 years, with the exception of the Veterans Health Administration and a select number of focused programs throughout the country, they have yet to become part of the standard of care in the US. This is partly because of the uneven results of the growing corpus of research literature, which remains markedly inconsistent in terms of describing the exact telehealth intervention. There are as many different RPM technologies and reporting platforms available for these interventions as there have been clinical applications of them. In well over a thousand documented telehealth studies published over the past 15 years, no two have been exactly alike in terms of the types of technologies deployed, how they were used practically, and the duration of the interventions. This heterogeneity in approach affects the generalizability of much of the literature.

Nevertheless, there are promising examples in the literature that describe statistically valid, positive telehealth outcomes determined by Randomized Controlled Trials (RCT) as they are applied to the treatment of Heart Failure. These include studies supporting reductions in all-cause mortality[4,5,6,7,8], all-cause hospitalizations[4,6,8,9,10], Heart Failure related hospitalizations[7,9,11,12,13,14,15,16,17], all-cause emergency department utilization[9,15,18], cost[16], and shorter lengths of stay in the hospital[4,9,13,24]. There are also numerous RCTs that have shown no statistically valid differences between intervention cohorts and those receiving usual care[25,26,27,28,29,30,31,32].

There's a greater number of observational studies using a variety of Propensity Score Matching (PSM) methodologies to identify retrospective, concurrent controls that demonstrate statistically valid positive outcomes for Heart Failure telehealth interventions[19,20,21,22,23]. Indeed, these retrospective studies are more common when it comes to distilling outcomes among members of commercial managed care entities, and those managed under other risk arrangements such as the patients managed by our organization, as these entities rarely have the luxury of offering telehealth services to only a subset of qualified individuals under pristine, randomized study contexts.

Nevertheless, it is among these entities where structured, complex care management pathways predominate at scale, offering the best opportunity to study the efficacy of a consistent approach to weaving telehealth into established complex care pathways applied to large populations. This study represents just such an observation.

Regardless, whether through RCTs or retrospective studies, both those that supported better outcomes through telehealth and those that did not, there remains a wide gap in the knowledge base represented by the literature. The most common omission is the lack of explicit detail about how the data collected through remote patient monitoring was analyzed in support of clinical decision making by remote care team members, and how this information was shared and acted upon in real-world clinical practice, particularly across clinical settings and across different centers of clinical accountability. Even the most sophisticated process for collecting data from the home can have little effect (outside of outcomes from better patient self-management as a result of sentinel effects) if the data is not acted upon in a timely way by clinical assets that have a standard protocol for intervention and care coordination. There are other notable limitations in the literature as well. The European models, wherein the PCP typically takes a direct role in tele-care management, may have limited applicability to North America where much of this monitoring and remote coaching is done by physician extenders and those not directly under the supervision of the PCP. Few studies have investigated direct return-on-investment (ROI) for the intervention, and none delineated between all costs and targeted costs. Most studies that looked at hospitalization rates used an index hospitalization as a start to the intervention, limiting applicability to approaches seeking at-risk candidates without a recent hospitalization. None looked at biometric improvements concurrently with utilization and financial outcomes over the course of the study period. Lastly, the majority of studies have underpowered sample sizes and short durations, widening the opportunity for biases.

Given the framework of past studies, our organization operated under two assumptions. First, for a remote monitoring intervention to have the best chance of driving desired outcomes, it must be driven by a confirmed process that governs who bears the responsibility for the clinical response to information and alerts generated by this surveillance. Second, for its efficacy to be studied in a way that has bearing on real world patient care structures, this intervention must be applied through a unified approach to remote patient management, using a consistent workflow across large populations of patients.

Given these assumptions, the purpose of the study was to determine the following:

- Whether a remote monitoring regime for patients with heart failure was effectively integrated into existing patient-provider arrangements, on a large scale, without having to disrupt existing practice workflows or reengineer the way these providers practice. In practical terms, this means that these practices did not have to hire additional staff to process the remote monitoring data but could outsource this activity with 3rd party telecare managers, acting as physician extenders, to assess and triage information and provide education and coaching. The role of the practices then is to react to triaged information suggesting a possible need for either further patient evaluation or a change in medical management of the patient according to standard best practice. This would best accommodate existing American models of chronic care management whereby physician extenders assume the majority of outreach and care coordination tasks in support of physician-directed plans of care, and not the physicians themselves.
- Did this heightened surveillance, and subsequent interaction with patients by remote care managers, done on behalf of these practices, make a difference (in terms of improved outcomes and reduced costs) in a model where there is not necessarily an anchoring hospitalization to trigger the process. Primary outcome variables are all-cause admission rates (defined as admits/1,000), total costs and the ROI derived from any cost savings. A secondary outcome was improved blood pressure management for the subset of enrollees who were hypertensive at baseline.

Assuming every 2-mmHg reduction in average systolic pressure reduces the risks for cardiac events by 5% and stroke by 8%, and every 5-mmHg reduction in average diastolic pressure reduces the risks for cardiac events by 21% and stroke by 15%[33],[34]. The average improvement in systolic hypertension translates into a 51% reduced risk of cardiac events and a 39% reduced risk of stroke. The average improvement in diastolic hypertension translates into a 41% reduced risk of cardiac events and a 51% reduced risk of stroke.

Study Limitations

The salient strength of the study remains that it assessed a unified approach to telecare management that defined not just how the technology was used to collect information from the home, but for how that information was acted upon according to a conformed workflow that governed who bore the responsibility for responding to the alerts generated, and trends identified, by the technology. Moreover, it involved an intervention introduced to a widely dispersed patient population, at scale, across numerous, diverse practices, thereby reflecting how these technologies can be used in real-world practice, and not just in artificially controlled environments, with small patient populations, managed by a tightly coordinated group of clinicians.

The limitations of the study are those inherent in any analysis dependent on retrospectively determined controls. First there is the inability to accommodate unknown variables in determining a propensity score. Second is the possible introduction of self-selection bias that may not be mitigated by the PSM methodology. For the latter, it is often argued that individuals who voluntarily decline a therapeutic intervention have poorer health literacy, and are less motivated to do what is necessary for effective self-management of their chronic conditions, although the strength of these effects are a matter of debate. Another limitation stems from the fact that some of the controls received some level of coordinated care management, although it varied a great deal by practice and by circumstance. For the intervention cohort, remote patient monitoring and coordinated care management were tightly woven together, hence it is not possible to know if a systematic care management regime alone would have provided a similar result. Only a prospective study with randomized controls will help determine the strength of these covariables. There is also the inability to control for variability in individual provider approach to heart failure management and their responsiveness to the events escalated to them by the remote care managers, even for similar patient morbidity profiles. Only a within-cohort study can mitigate the effects of such secular variables. Lastly, those with functional or cognitive limitations were not removed from the controls, which may have introduced added risk elements to that cohort. Nevertheless, these disqualified candidates represented less than 3% of the total non-enrolled population, so the overall effect should be limited.

Still, the study remains an intriguing addition to the growing corpus of literature that supports the efficacy of a consistent, well-defined approach to using information gleaned from remote monitoring processes, and for acting on that information to mitigate the exacerbations of Heart Failure in the timeliest way. The next steps would be to structure a prospective, randomized study that controls for the effects of a consistent Heart Failure care management regime. Only then will the true additive effects of remote monitoring come into view.

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Table 1. Baseline characteristics of intervention and control patients, before and after propensity score matching

All Optum Risk Scores

		All Patients			Matched Patients			% Improvement
Variable	**Metric**	**Control**	**Measure**	**Diff**	**Control**	**Measure**	**Diff**	**Reduction in Diff.**
Observations	#	7,638	1,783	--	1,719	1,719	--	--
Propensity Score	Mean	0.1802	0.1859	0.0057	0.1858	0.1861	0.0002	96%
	Std.Dev	0.0285	0.0287	--	0.0266	0.0268	--	--
Optum Risk Score	Mean	20.02	20.77	0.75	19.61	20.19	0.58	23%
	Std.Dev	11.50	11.52	--	10.96	10.48	--	--
Pre Period PMPM	Mean	1,364	1,220	-144	943.6	1,095	151	-5%
	Std.Dev	3,216	1,933	--	1,853	1,577	--	--
Seasonality (Month of Start of Care)	Mean	5.61	5.09	-0.52	5.06	5.06	0.00	100%
	Std.Dev	3.57	2.88	--	2.87	2.87	--	--
Gender (Female = 1; Male = 0)	Mean	0.5194	0.5356	0.0162	0.5317	0.5387	0.0070	57%
	Std. Dev	0.4996	0.4987	--	0.4990	0.4985	--	--
Age	Mean	76.65	76.17	-0.47	77.25	76.21	-1.04	-120%
	Std.Dev	9.07	8.71	--	8.94	8.71	--	--

High Risk Subset (Optum ≥ 20)

		All Patients			Matched Patients			% Improvement
Variable	**Metric**	**Control**	**Measure**	**Diff**	**Control**	**Measure**	**Diff**	**Reduction in Diff.**
Observations	#	2,661	680	--	580	635	--	--
Propensity Score	Mean	0.1902	0.1979	0.0077	0.1994	0.1985	-0.0009	88%
	Std.Dev	0.0390	0.0371	--	0.0342	0.0336	--	--
Optum Risk Score	Mean	31.60	31.46	-0.14	30.65	30.35	-0.31	-118%
	Std.Dev	12.04	11.87	--	11.97	10.56	--	--
Pre Period PMPM	Mean	2,322	1,951	-371	1,675.2	1,701	26	93%
	Std.Dev	4,575	2,651	--	2,820	2,094	-	--

Seasonality (Month of Start of Care)	Mean	5.43	4.78	-0.65	4.74	4.71	-0.03	95%
	Std.Dev	3.85	3.06	--	3.09	3.05	--	--
Gender (Female = 1; Male = 0)	Mean	0.5622	0.5529	-0.0093	0.5586	0.5591	0.0004	95%
	Std. Dev	0.4961	0.4972	--	0.4966	0.4965	--	--
Age	Mean	78.22	77.95	-0.27	78.92	78.01	-0.91	-236%
	Std.Dev	9.00	8.80	--	8.53	8.88	--	--

Table 2. Utilization and cost outcomes. Cost outcomes are presented as return on investment (ROI) ratios in place of absolute dollar values.

Measure	Estimated Difference in Difference (Intervention vs. Control, Post vs. Pre) [95% CI]	p-value
All study patients		
Hospital admissions per 1000 patients per year	-134 [-198, -73]	<0.0001
ROI	2.68 {1.17, 5.08]	0.005
High risk patients		
Hospital admissions per 1000 patients per year	-157 [265, -53]	0.003
ROI	4.60 [1.84, 8.20]	0.004

Table 3. Blood pressure outcomes for patients in the intervention group only who were hypertensive at index date.

Category	Patients with systolic hypertension[I] (n=500)	Patients with diastolic hypertension (n=140)
Initial blood pressure[II] in mmHg, Mean (SD)	159 (13)	97 (7)
Final blood pressure [III] in mmHG, Mean (SD)	142 (20)	86 (12)
Difference between final and initial blood pressure, in mmHG, Mean (SD)	-16.8 (18)	-11.3 (10)
Patients with any improvement in blood pressure from baseline, N (%)	400 (80%)	118 (84%)
Patients with final blood pressure averages in last 10 days of observation meeting JNC8 guidelines, N (%)	275 (55%)	84 (60%)

[I] Patients with systolic hypertension and diastolic hypertension were analyzed separately, and patients could be included in both columns if both systolic and diastolic pressures were not at goal at baseline.
[II] Initial blood pressure was defined as the average of measures taken during the first 10 days of the intervention (even if this occurred prior to the study period).
[III] Final blood pressure was defined as the average of measures taken during the last 10 days of observation within the study period.

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