The Policy Environment of Remote Patient Monitoring: Evaluating Stakeholders' Views

Abstract

Technological innovations in healthcare are becoming more common and offer many benefits. Trust is a central for individuals' views about the efficacy and adoption of technological solutions to improve healthcare. In this study, we explore remote patient monitoring (RPM) devices and how trust in managing institutions and the technology shapes acceptance and adoption for improved healthcare. Data collected from professional stakeholders (n=198): managers in public and private organizations who are responsible for administrating RPM devices into the US medical system. We implement multiple imputation to correct for missing data and regression models for analysis. Results show that both dimensions of trust (institutional and technological) are strong predictors of attitudes about different public policy options. We also find that costs affect views of proposed policies. Our findings expand existing knowledge by illustrating the need to consider trust in institutions when designing public healthcare policies that involve innovative technologies like RPM devices.

Keywords: Remote Patient Monitoring (RPM); Technology innovations; healthcare policy, research methodology; professional stakeholders; institutional trust; technology trust; regression models; multiple imputation; public policy

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1 Introduction

Innovations in healthcare have been something patients, practitioners, government officials and the general public have come to expect. The field of healthcare has been transformed by technological innovations, public health improvements, advanced treatments for chronic diseases, genetic discoveries and related generic-based treatments. All these elements offer to

revolutionize healthcare delivery and significantly improve outcomes, especially among the chronically ill poor in our communities (Steinhubl, Muse and Topol 2015).

Social and behavioral research on technological innovations in healthcare explore important questions related to the efficacy, acceptance, adoption and diffusion of medical innovations. Those studies focus on aspects such as costs, government policies, insurance coverage, legal responsibility, privacy and personal data, public risk assessments, cultural barriers and the presence or absence of family and community support systems. Overall, findings of this research demonstrate that devices, techniques, and treatment modalities need more than scientific and technological rigor and applicability to find their way into the complex medical delivery system.

In this study, we focus on one of the major innovations being developed and deployed in the U.S. healthcare system - remote patient monitoring (RPM) devices that are used to evaluate patient status at any given time or to provide special alerts if an indicator reaches a critical threshold (Andreu-Perez and Yang 2015). Monitoring devices and related delivery processes have been deployed and tested most recently in diabetes management, such as various types of glucose monitors and related oversight systems (Cappon et al. 2017; Lee et al. 2017; Scognamiglio 2013).

One of the central challenges of this technology in the context of public healthcare is that at present, RPM devices are relatively costly and require frequent replacement and recalibration, limiting their use to wealthier, insured patients. We tackle this challenge by focusing on questions related to public policies about the implementation, regulation and funding of RPM technology. By examining these issues, we can improve our understanding of the required steps needed towards a broader application of these systems among the public and in particular among those at-risk that need it most.

Our work expands the existing research in two ways. First, while most studies of RPM technology center on questions about effectiveness, infrastructure and patient views, we highlight the aspect of trust in the systems and organizations that manage and deliver it. The adoption of health innovations requires a substantial behavioral change from both consumers as well as the system that supply the technology. The degree of trust that individuals assign to those

that manage these tools is a crucial part of the chain leading them to accept the benefits of adopting devices such as RPM.

Second, we focus on the views of *professional stakeholders* - key actors who are instrumental in the design, adoption and utilization of RPM technology into the U.S. medical system. Those individuals hold various leadership positions across several industries in the US: healthcare providers, insurance providers, and government officials. By assessing the viewpoint of stakeholders, those who are likely to have important input on decisions related to funding, providing access and managing the application of RPM, our work complements the extant literature and provides further insights about the prospect of a wide-scale implementation of RPM devices managed by the public sector.

2 Remote Patient Monitoring: Scientific Background

The use of wearable biosensors to acquire, transmit, process, store and retrieve health-related data include a variety of non-invasive devices and has been termed by scholars and health professionals as *Remote Patient Monitoring (RPM)* (Noah et al. 2018). The terminology also includes mobile health, eHealth (Oh et al. 2005; Steinhubl, Muse and Topol 2015), or telemedicine (Chepesiuk 1999; Sood et al. 2007). In this study, we refer to *RPM technology* which describes biosensors that have been integrated to different types of platforms including watches, wrist belts, skin patches, textiles, and smartphones (Ajami and Teimouri 2015; Steinhubl, Muse and Topol 2015).

One of the most dominant areas of research in this area is the effectiveness of these devices in alleviating health issues such as chronic and infectious diseases. Evidence about the usefulness of the technology is critical to its wide-scale adoption. In the face of aging populations and high health care costs, an effective technology such as RPM can alleviate some of these challenges (Atallah, Lo and Yang 2012). As an example, scholars suggest that shifting the primary monitoring of hypertension to such devices can reduce the amount of hospital visits. For patients, this outcome has clear health-related, financial and convenience benefits (Steinhubl, Muse and Topol 2015).

Despite these benefits, existing evidence about the effectiveness of RPM devices is still mixed and highly contingent on the measures used. Some have shown that patients who include self-

monitoring as part of their healthcare plan are more likely to achieve blood pressure control (McManus et al. 2014). A study that focused on assessing RPM for chronic heart failures showed that patients who received rapid intervention had the lowest mortality rate compared to usual care practices (Nakamura, Koga and Iseki 2014). On the other hand, some research argues that it is less clear how effective are RPM devices for preventing future hospitalization after discharge (Ong et al. 2016). A recent meta-analysis that assessed studies using random controlled trials (RCTs) and multiple measures of effectiveness and devices found that using RPM in select conditions can be useful when combined with tailored coaching and application of different health behavior models. However, the analysis also showed large heterogeneity within the groups where RPM is useful (Noah et al. 2018).

2.1 Remote Patient Monitoring: Social and behavioral studies

The vast majority of research on RPM technology in healthcare focuses on its usefulness. Our study addresses a complementary area as we explore an important question related to the social and behavioral aspects of technological innovations in healthcare.

Studies assess many research questions within the category of social and behavioral work. For instance, the costs of devices for users. Using measures of hospital admissions, patient travel and emergency room visits, researchers show that RPM devices reduce costs for patients (Bowles et al. 2011; Mierdel and Owen 2015). At the same time, in the US, RPM devices are currently not covered by healthcare programs such as Medicare and Medicaid, making it substantially costlier for patients. Using the technology requires purchasing expensive equipment which does not always cover the saving in healthcare facilities visits. In this context, studies show that expenses vary between conditions, but remain relatively high, especially in the US (Peretz, Arnaert and Ponzoni 2018). Therefore, increasing access to RPM through cost reduction requires legislation and government support for funding.

Since RPM technology gathers patients' information, a surge of studies explored questions on personal data privacy. The technology relies on data mining using non-invasive (blood pressure monitors) or invasive (microchips or smart pacemakers) devices. This led to growing concerns among scholars about the need to ensure data privacy, and establishing clear guidelines about how providers share this data (Steinhubl, Muse and Topol 2015). As a whole,

privacy issues are critical among the users of any technological innovations in the area of healthcare (Horvath et al. 2022), and specifically with respect to using RPM devices (Milner et al. 2021). In response, many studies offer technical accounts of solutions that ensure the privacy and security of the data (Griggs et al. 2018; Hayajneh et al. 2016).

Another important behavioral aspect is patients' attitudes with respect to the use of RPM technology. Overall, results suggest that patients find many benefits including greater feeling of empowerment and control regarding their health conditions (Nissen and Lindhardt 2017), better understanding of their own conditions and being more prepared for upcoming doctor visits (Rexhepi et al. 2018). Recent study by Di et al. (2021) demonstrates the important role that such technology has on enhancing patients' feelings of self-efficacy. At the same time, there are multiple tensions between patient and healthcare professionals' concerns that make the design and use of RPM technology complicated. Studies proposed frameworks that integrate those concerns in the design of various monitoring devices (Andersen et al. 2019).

Despite the substantial increase in research on RPM technology, one central concern is the relative lack of data and systematic testing of existing data to derive clearer inferences about the likelihood that medical professionals and patients would adopt it (Noah et al. 2018; Seto et al. 2010; Vegesna et al. 2017). In this context, one area that received limited attention is the views of *professional stakeholders* – individuals in leadership positions who are directly or indirectly associated with the healthcare industry and play a critical role in plans for wide-scale implementation of RPM devices. Since such programs require financial, regulatory, and managerial input, it is also a public policy concern. Therefore, surveying the views of professionals in these sectors is also important.

This research tackles this gap by focusing on the opinions of professional stakeholders. We collect data on the attitudes of healthcare providers, insurance providers and various government officials with regard to this technology. In addition, we address a topic that received less attention in the literature - the degree of trust in the systems that are intended to administer and manage the use of RPM devices. In the next section, we discuss the role of trust and its effects on individual attitudes with regard to public policy actions and the application of RPM technology.

3 Trust, technology and public healthcare policy

3.1 Trust in government and healthcare policy

The conceptual framework we propose in this study expands existing research regarding the use of RPM technology. We focus on the role of trust as an important factor in the relationship between policy solutions focusing on technology in healthcare, and those who design plans and manage RPM field implementation. In the context of public policy, trust refers to the level to which members of society perceive the government's ability to correctly and fairly execute its responsibilities (Feldman 1983).

Trust is an important concept in research on public policy. For our purposes, trust in public policies is "a reflection of government performance" (Keele 2007, p. 242). Research on trust has shown important role for this concept with respect to the interpretation of different types of public risks (Dvir et al. 2022; Hetherington et al. 2005) and support for government policies in the face of risks from climate change (Lorenzoni et al. 2006; Kellstedt, Zahran and Vedlitz 2008), national security (Davis and Silver 2004; Robinson et al. 2013), global pandemics (Bargain and Aminjonov 2020) and more.

What role does trust in government plays in the context of healthcare and technology? When individuals face risks from circumstances they have less knowledge of, in this case, their health, they need to trust the professionals who are responsible for helping them manage the risk. Medical researchers view trust as an optimistic acceptance of a vulnerable situation in which the truster believes the trustee will care for the truster's interests. Thus, for health issues, trust is inseparable from vulnerability, and the greater the risk, the greater the potential for either trust/mistrust (Hall et al. 2001, 2002). Building on these insights, we extrapolate the role of trust beyond the patient-healthcare professional two-way relationship, and view it as critical in the acceptance of new tools that can support public healthcare delivery.

3.2 Trust in technological innovations and public healthcare solutions

Our theoretical framework connects the concept of trust to the decision of individuals whether to adopt a new technology to improve the delivery of public healthcare. Past work on individuals accepting technological innovations discussed the important role for different types

of trust, mostly distinguishing between interpersonal (with one's colleagues) and technology trust (the technological solutions). Studies suggest that the combination of both elements is crucial in the adoption of new innovations (Lippert and Davis 2006). We adopt this distinction and discuss two types of trust related to individuals' support for healthcare solutions.

3.2.1 Institutional trust

The first type of trust we discuss describes the degree to which individuals trust the organizations that introduce and manage the innovation, and how it affects their attitudes about adopting the technology. According to Bahmanziari, Pearson and Crosby (2003), when individuals contemplate using a new technology, a crucial factor is the trustworthiness of the institutions or organizations providing access and distribute the new technology. Priest (2001) found that trust in 'institutional actors' was a strong predictor of support for biotechnology. Janssen et al. (2020) also mention the important role of trust in those that govern or manage the solutions as crucial in accepting blockchain technology. Recent work explored this dimension of trust with regard to technological solutions and health facing the threat of the COVID-19 global pandemic (Horvath et al. 2022). Focusing on trust in institutions such as NHS and the British government, the findings, which also investigated questions of data privacy, show that increased trust in such organizations reduce concerns of privacy when using mobile apps to conduct COVID-19 contact tracing. Similarly, Fox and Connolly (2018) demonstrate how trust positively affects adoption of mobile health technology among older adults in the UK (see also Dinev et al. 2016; van Velsen et al. 2015).

Expanding this logic for a government led implementation of technological solutions in health policy, individuals' trust in the agencies who will oversee any innovation's entry into an existing service delivery system is a crucial necessity for successful implementation, compliance and long-term funding support (Robinson, Stoutenborough and Vedlitz 2017).

3.2.2 Technological Trust

Another angle of trust in the adoption of technological tools relates to the instrumental dimension of trust. Technological trust refers to views about the of usefulness and effectiveness as drivers of individuals' attitudes about using new health technology. This approach fits with work that

highlights trust in the technological solution (Lippert and Davis 2006). In the context of medical research, scholars view trust as important to patients' willingness to seek care, reveal sensitive information, and submit to treatment (Hall et al. 2001; Trachtenberg, Dugan and Hall 2005). In other words, the likelihood of individuals accepting the potential benefits of treatment using a technological solution is dependent of their level of trust in the devices. Multiple studies have shown that this type of trust is crucial in the adoption of technology solutions such as wearable devices or patients providing access to private medical information (Anderson and Agarwal 2011; Li et al. 2016; Sun et al. 2013).

In figure 1, we depict our model. The main premise is that for innovations like RPM to be accepted and used, both types of trust - institutional and technological, are needed by the public, medical providers and other stakeholder groups. Professional stakeholders are important due to their role as those who will manage the operation, regulation, and funding of these innovations. Without trust in both the products and processes surrounding an innovation, their acceptance, utilization and efficacy are likely to be compromised.

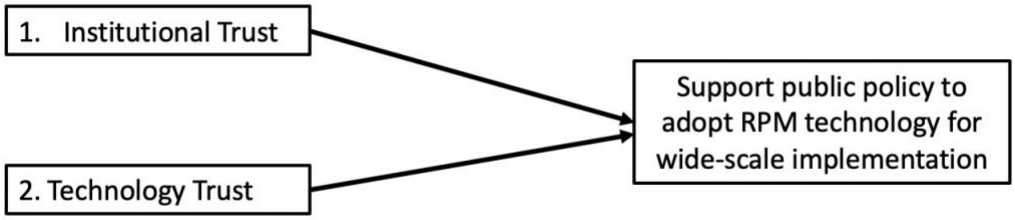

Figure 1: Trust and technology solutions in health care

Based on this discussion, our central proposition is that stakeholders' support for a wide-scale adoption of new technology such as RPM devices is associated with their degree of trust in government institutions.

Institutional Trust Hypothesis*: The higher the trust of respondents in government agencies and managing organizations, the higher their support for the implementation of wide-scale RPM use with government management*.

In addition, the effectiveness/usefulness of new innovations or technology are also crucial for their acceptance by consumers. Therefore, our secondary proposition is directed at stakeholders' perceptions about the effectiveness and support for this technology.
Technology Trust Hypothesis*: The more useful a technology solution seems to be, respondents will support the implementation of wide-scale RPM use under government management*.

4 Method

Data were collected by the Texas A&M Public Policy Research Institute (PPRI) who fielded the survey between September 19th and December 18th, 2018. PPRI administered a web-based questionnaire through both a direct outreach process and Qualtrics Online Panels. Total enrollment was 300, and 198 completed surveys were collected for a completion rate of 66%.

As we described earlier, one of the central contributions of this study is the focus on professional stakeholders and measuring their views. The stakeholders selected for our survey were in professional leadership positions in key organizations with a current or potential role in the development and adoption of RPM. The organizations included healthcare providers, community health advocates, insurance providers and different government agencies.[†]

4.1 The Instrument

The survey questionnaire included items measuring respondents' opinions on the main issues explored in this study (trust, policy support). A second section of the instrument collected demographic information from the respondents. Below, we describe the measures used to account for all variables in our study.

[†] Our selection criteria relied on a mix of three approaches. First, identify relevant stakeholder organizations through online resources, contacting the organizations and using the professional network of members of the research team. Second, we invited members of relevant professional associations and networks to participate. Third, using the snowball technique, participants were asked to identify other potential participants that they recommended. More specific details are available from the authors.

4.2 Dependent Variables

We measure support for government management of RPM with five items, all measured on an 11-point scale (0= "Completely oppose" -10= "Completely support"): (1) Medicaid program pay for RPM services for their eligible enrollees; (2) Medicare program pay for RPM services for their eligible enrollees; (3) Increase government funding for use of RPM; (4) Government establish clear guidelines about permitted uses of RPM; (5) Encourage private insurance companies to lower premium for patients who use RPM.

4.3 Independent Variables

Our main explanatory factor is *institutional trust*. We measure it with a survey item which asks respondents how much they trust/distrust various actors to address chronic health conditions and diseases successfully. Responses are measured on an 11-point scale (0= "Completely distrust" -10= "Completely trust"). There is a total of 12 items in this group including government agencies (federal, state, and local), insurance companies, pharmaceutical companies and professional health providers.

As we discuss in the theory section, support for government management of RPM technology also depends on respondents' views of how useful or effective the new technology is perceived to be, what we refer to as *technological trust*. Since previous work already established that professionals view this technology as beneficial, we rely on measures from the survey that indicate respondents' encouragement of expanding the use of the technology. The main item asks respondents how much they agree with the statement "*Routine application of RPM should be encouraged"* (measured on a 0-10 scale). We expect that respondents who rank high on this measure will display greater support for government implementation of RPM devices.

4.4 Control Variables and Demographics

We also collect data for several control variables, as well as individual covariates. To ensure that we capture broader aspect of respondents' attitudes about government management of RPM devices usage, we use items that measure views about current implementation and regulations of RPM by the government. Also, we include items that account for perceptions about patients'

challenges, and overall view of the benefits of technology for better quality of life.[‡] Lastly, individual demographic indicators include gender, level of education, age and organization in which a respondent is employed. In table 1, we detail the main variables used and their scales in the survey.[§]

Table 1: Study main variables

Variable names	Items in survey	Measure scale
Government policies (DVs): degree of support	Medicare pay: eligible enrollees	0-10
	Medicaid pay: eligible enrollees	
	Government increase funding	
	Government establish guidelines	
	Lower private insurance premiums	
Trust (IV): Institutions	Federal government	0-10
	US Medicare program	
	US Medicaid program	
	Private health insurance companies	
	Healthcare providers	
	Government regulation of RPM use	
Trust (IV): Technology	Tech innovations improve life quality	0-10
	Encourage routine RPM usage	
	RPM benefits outweigh risks for patients	
Concern: Costs	RPM technology is costly for patients	0-10
	Patients' out-of-pockets costs	
***Demographics**: Age (categories), gender, government job (binary)*		

5 Results

Our empirical analysis focused on respondents' attitudes towards government policies with respect to the use of RPM devices. In the following section, we discuss our sample characteristics, and our approach to correct for missing data in the survey. Then, we detail both a descriptive and an inferential analysis of the (corrected) survey data to assess stakeholders' views of RPM usage in health care.

5.1 Sample Characteristics and Demographics

[‡] All items are measured on a 0-10 scale.
[§] Full survey instrument is available upon request directly from the authors.

Our final sample of stakeholders included 198 respondents. In terms of their professional affiliation, a third of the sample worked for health provider organizations (68 respondents, 34%), 32% worked for the government and 30% were insurance companies' executives. The average experience in years was 14 years and the median was 10 years (longest tenured stakeholder has 53 years of experience, and 52 respondents worked in their organization for five years or less).

The sample was primarily white (88% of respondents) and male (66% of respondents). Most respondents were in the age range of 45-64 years old (almost 60% of sample). Education levels included 34% with a Bachelor's degree, 27% have a Masters' degree and a little over 21% with a PhD., MD or JD.

5.2 Missing data correction

The first challenge we encountered is the need to correct for missing data in our survey. For most of our variables of interest, the extent of missing data is low (under 10%). Yet, in a small number of cases, the proportion of missing responses is as high as 30%.

In order to improve the accuracy of our analysis and obtain more precise estimators, we employed a multiple imputation procedure to correct for missing data (Murray 2018). In the methodology literature, multiple imputation is a highly efficient procedure to address the problem of missing data (Carpenter and Kenward 2012; Rubin 2004). The procedure is based on the assumption that values are missing in random, and includes creating multiple copies of the data while filling-in replacements for the missing values. Then, performing an analysis of the completed data and a polling phase (Enders 2010).

We implemented the procedure using the *mice* package in R statistical software. The procedure produces five samples of our imputed variables to which we added the individual covariates from the original dataset. To increase our confidence in the analysis, we ran all tests on each of the five samples and ensured that no significant differences exist.[**]

[**] Our robustness test procedure showed that results are consistent across all five imputed datasets (see online appendix file). Test procedure and detailed results are available upon request from the authors.

5.3 Descriptive Analysis

We begin by displaying the extent of support of our survey respondents for the proposed policy options with regard to the use of RPM devices. There are five policy options that fit into two broad categories: who pays for RPM use? and how much government regulation is needed? In figure 2, we present the mean level of support for each policy (0-10 scale). The results indicate a strong preference for funding of RPM technology by private insurance companies, followed by federal programs such as Medicare. The difference between these two options is significant, albeit only at the 90% level. Government funding is the least preferred option with a mean that is about 20% lower than funding by private insurers, or 15% lower than the Medicare program. The findings also suggested that despite lower degree of support for funding by the government, stakeholders did prefer that the government will define the guidelines for using RPM devices.

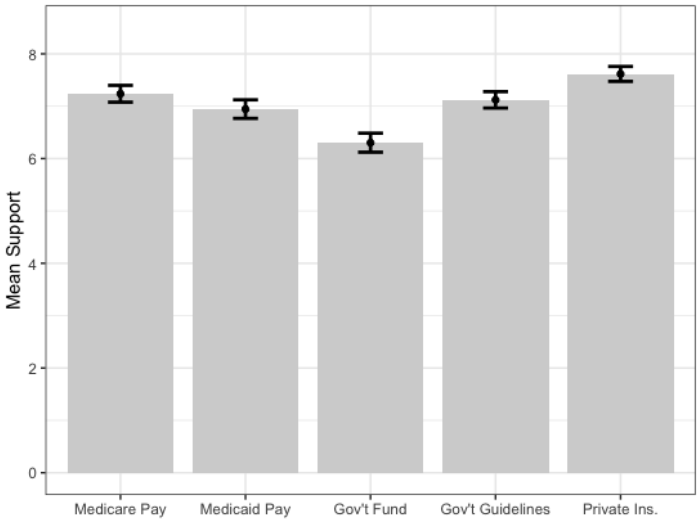

Figure 2: Proposed policies – Stakeholders' support

Next, we present the distribution of the institutional trust indicator, our main explanatory variable. In the methods section, we mentioned that the item consists of 12 different agencies and organizations. Instead of assessing such large variation of actors (some may overlap, for instance trust in government and several federal agencies), we focused on five actors: (1) the federal government; (2) Medicare program; (3) Medicaid program; (4) private health insurance companies; (5) healthcare providers. The mean levels of trust (on a 0-10 scale) are depicted in figure 3.

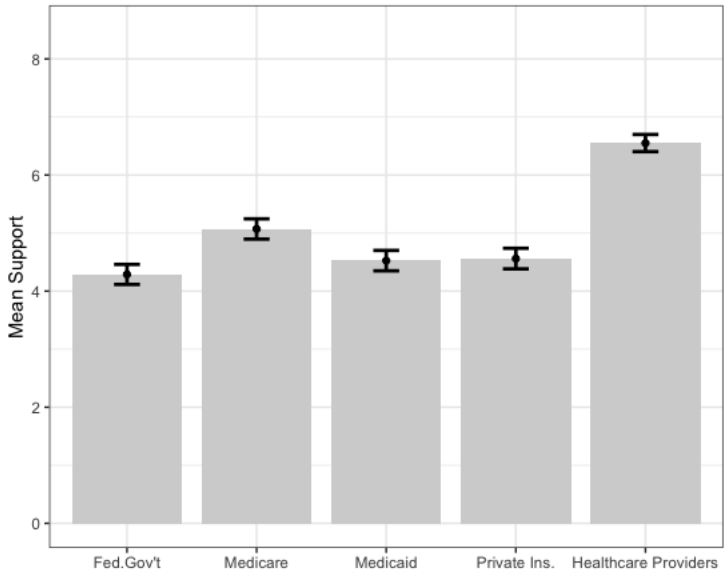

Figure 3: Stakeholders' levels of Institutional Trust

The most glaring finding is that respondents exhibited much higher levels of trust in professional healthcare providers than in government programs or private companies - trust in healthcare providers is more than 50% higher compared to the federal government, and 43% higher than private insurers. These findings suggest a potential restriction on government-supported management of RPM technology.††

The attitudes displayed on figures 2 and 3 suggest that trust can be a significant factor in shaping perceptions towards government-led policies for wide-scale use of RPM devices. If stakeholders do not trust the federal government to address chronic health conditions, how likely are they to support and properly implement different policies that fall under the government responsibility? To evaluate this type of questions, we turn to our main analysis that emphasizes the effects of trust (and perceptions about RPM effectiveness) on support for different policies.

†† Similar to the findings shown in figure 2, respondents felt greater degree of trust towards the Medicare program (m = 5.07), which may reflect their greater support for funding the technology using Medicare.

5.4 Regression Analysis

The discussion above offers a descriptive presentation of the data regarding stakeholders' attitudes about our main variables of interest - the policy options as well as levels of trust in those that manage and implement them. In order to test more clearly this relationship, we ran a series of regression models in which we regressed the different policy options (as depicted in figure 2) on the relevant trust measures. As discussed in the theory section, we also accounted for views about the usefulness of the technology (which we termed trust in technology). Table 2 displays all four regression models.

Table 2: Drivers of RPM policy support – OLS regression models

		Dependent Variables: Public Policies			
		Medicare (Model 1)	Govt. Fund (Model 2)	Govt. Reg (Model 3)	Low Prem (Model 4)
Trust: Institutions	Federal Govt.	-0.063 (0.088)	0.275*** (0.080)	0.221*** (0.069)	-0.037 (0.060)
	Medicare	0.110 (0.084)			
	Regulation	0.188** (0.073)	0.328*** (0.080)	0.240*** (0.069)	0.029 (0.060)
	Private Ins.	-0.107 (0.071)	-0.165** (0.078)	-0.100 (0.067)	-0.111* (0.059)
	Health Pros.	0.106 (0.080)	0.018 (0.089)	0.045 (0.076)	0.112* (0.067)
Trust: Technology	Tech is Good	0.013 (0.097)	0.096 (0.106)	0.055 (0.091)	0.148* (0.079)
	RPM Usage	0.236*** (0.083)	0.205** (0.092)	0.099 (0.079)	0.267*** (0.069)
	Net Benefits	0.324*** (0.097)	0.163 (0.107)	0.289*** (0.092)	0.298*** (0.080)

Individual Covariates	Age (Category)	0.061 (0.121)	0.0004 (0.135)	0.224* (0.115)	0.087 (0.101)
	Gov. Job	0.378 (0.320)	-0.261 (0.352)	-0.289 (0.302)	0.428 (0.264)
	Gender	0.429 (0.312)	0.836** (0.346)	0.714** (0.297)	0.633** (0.260)
	Constant	1.385 (0.928)	0.614 (1.026)	1.031 (0.879)	1.957** (0.770)
Observations		198	198	198	198
R^2		0.264	0.289	0.293	0.349

*Notes: *p < 0.1; **p < 0.05; ***p < 0.001*

Standard errors in parenthesis

The dependent variables in models 1-4 are the different policy options. Beginning with the main independent variable measures - trust in the capability of the federal government to address chronic health issues is a powerful predictor for supporting policy options that center on governmental action. In model 2, we estimated the policy of increase government funding for using RPM. Shifting from the lower end of trust in government (the 25th percentile) to the top-end (the 75th percentile) led to an increase of almost 20% in the extent of support for the policy. Model 3 tests the policy of government establishing guidelines for using RPM. In this instance, the coefficient for trust in government is significant and positive, and a shift from low- to high-end values of institutional trust leads to an increase of 13% in support for the policy.

Another central measure we used for trust in institutions is regulation - the item asked how much respondents agree with the statement that RPM technology is not supported by current regulations, suggesting a need for greater government intervention. The coefficient is positive and significant in models 1-3, suggesting that respondents who viewed existing RPM-related government regulation as insufficient, are more supportive of adopting policies that highlight the

government including reliance on the Medicare program, additional regulation and direct funding by the federal government.

The third indicator of institutional trust measures attitudes regarding trust in private insurance companies. Evidence for this measure is mixed - it is negative and significant for the government funding policy, suggesting that those who trust private insurers are less supportive of federal intervention in the administration of RPM devices. Unsurprisingly, this variable also matters for model 4 (encouraging insurance companies to lower their premiums). The negative coefficient indicated that those who trust private insurers are less supportive of pressuring them to lower their premiums in funding RPM technology. At the same time, this variable had no effect on support for using Medicare and is on the verge of statistical significance ($p = 0.13$) for model 3 (increase federal regulation).

The last two institutional indicators are less prominent. In model 1, we included a measure of trust in the Medicare program, yet it failed to reach statistical significance when we estimated its effect on support for this specific policy solution. Also, we included a measure for trust in healthcare providers, which is prevalent in the literature, but it did not seem to have a consistent effect on the attitudes of stakeholders toward most policies.

Our empirical analysis also accounted for the role of trust in the technology itself. We employed three items from the survey. First, a general measure of trust in using technology for improved healthcare. This measure had a very weak effect on policy evaluations as it failed to reach statistical significance in all but one of the models. Second, we used a measure that captures trust in RPM devices and a belief in the need to use them more routinely. This measure is a powerful predictor as it is highly significant ($p < 0.01$) in models 1, 2 and 4. Trust in RPM devices is important for both federal and private insurance funding. For example, shifting from low to high trust values (25^{th} to 75^{th} percentile) increased support for Medicare or general federal funding (models 1 and 2) by over 10%.[‡‡] Third, we employed a more specific indicator of trust in RPM - the item measures attitude about RPM devices as delivering more benefits than risks to patients. This variable was also highly significant in models 1, 3, and 4 ($p < 0.01$) suggesting

[‡‡] Similar change is evident in model 4 (about 10%) which accounted for private insurance coverage.

that those who trust RPM technology (view it as useful and efficient) supported various policies that can make it easier for patients to acquire the devices.

Finally, we had no pre-registered expectations regarding the individual covariates. The only variable that was relatively consistent is respondents' gender - on average, women were about 10% more supportive of federal and private funding (models 2 and 4), as well as additional government regulation (model 3) compared to men.

5.5 The role of costs – regression analysis

The analysis thus far offered substantial evidence about the important role that both dimensions of trust (institutional and technological) had on stakeholders' support for different policies. By including measures of effectiveness (termed 'technological trust') we accounted for multiple aspects that the literature had demonstrated as associated with RPM devices.

As we mentioned earlier, costs represent another critical element in the evaluation of RPM usage. To account for this factor, we conducted two more tests using survey measures that ask respondents for their degree of concern about issues of costs. The first variable is more general and asks whether RPM technology is costly for patients. The other variable asks more specifically about concerns for patients' out-of-pocket expenses (both measured on a 0-10 scale).

Results of the regression models are in table 3. Due to space constraints, we present the results for two policies only: government funding, and encouraging private insurers to lower their premiums. For each policy option, we tested the effects of the general and specific cost indicators in addition to the main trust factors.

Table 3: Drivers of RPM policy support – OLS regression models II

		Dependent Variables: Public Policies			
		Govt. Fund	Low Prem	Govt. Fund	Low Prem
Trust: Institutions	Federal Govt.	0.270***	-0.036	0.257***	-0.030
		(0.080)	(0.057)	(0.081)	(0.059)

	Private Ins.	-0.194** (0.077)	-0.105* (0.055)	-0.155** (0.077)	-0.076 (0.057)
Costs: Patients	General	0.225*** (0.077)	0.226*** (0.054)		
	Out-of-Pocket			0.191*** (0.068)	0.090* (0.050)
Trust: Technology	Tech is Good	0.110 (0.107)	0111 (0.076)	0.143 (0.106)	0.162* (0.077)
	RPM Usage	0.279*** (0.095)	0.315*** (0.067)	0.301*** (0.097)	0.296*** (0.071)
	Net Benefits	0.149 (0.109)	0.275*** (0.077)	0.076 (0.114)	0.254*** (0.084)
Individual Covariates	Age (Category)	-0.013 (0.137)	0.100 (0.097)	-0.007 (0.137)	0.092 (0.101)
	Gov. Job	-0.335 (0.354)	0.340 (0.251)	-0.300 (0.355)	0.364 (0.260)
	Gender	0.812** (0.352)	0.626** (0.250)	0.811** (0.353)	0.646** (0.259)
	Constant	1.036 (0.990)	1.582** (0.702)	0.985 (1.003)	2.048*** (0.735)
Observations		198	198	198	198
R^2		0.258	0.394	0.255	0.350

*Notes: *p < 0.1; **p < 0.05; ***p < 0.001*

Standard errors in parenthesis

Two sets of findings emerged from this analysis: first, while we included indicators for costs, both trust elements remain consistent in their effects on the extent of support for either policy. Mostly, trust in government was statistically significant for supporting the federal

funding policy ($p < 0.01$). Similarly, the effect of trust in private insurers influenced (negatively) the support for policy which calls to pressure insurance companies to reduce their premiums. The effects of technological trust (usefulness measures) remained consistent as in table 2.

Second, concerns about the costs for patients who are using RPM also influenced policy support. For the general costs item, policy support increased by almost 10% the more respondents viewed costs as a substantial issue. Similar effects were evident for the specific costs measure - how concerned are stakeholders from increasing out-of-pocket expenses. The coefficient is significant in both models, albeit much stronger in the government funding model ($p < 0.01$; $p < 0.1$). For this measure, as concerns from these costs increased (25^{th} to 75^{th} percentile), support for the government funding policy increased by approximately 9%.

5.6 Trust measures - Conditional effects

The final section of the empirical analysis includes a brief assessment of the conditional relations between both trust elements. More specifically, since trust is composed of both institutional and technological aspects, an interesting question is how their combined effect influenced the reported support for different policies.

We accounted for this question by running an interaction model which focused on the conditional relations between trust in the federal government (institutions) and encouragement for the use of RPM devices (technological trust). For an easier discussion of this analysis, the plot below displays the change in the effect of trust in RPM technology conditional on two levels of trust in the federal government: high and low (75^{th} and 25^{th} percentiles). The model assessed how the combined trust elements affected the support for the policy of increased federal funding.

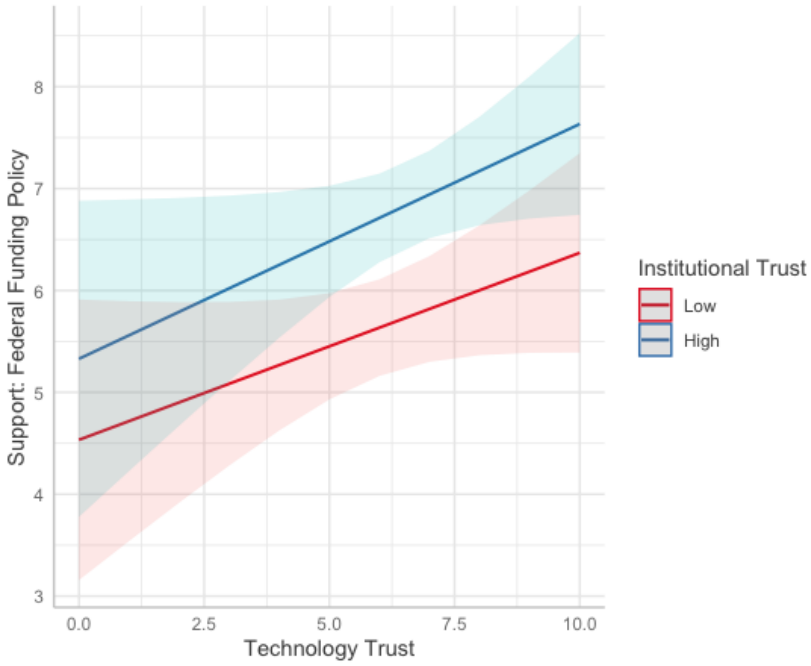

Figure 4: Conditional Effects

Overall, the effect is positive. Yet, for the most common values of technology trust (between 5-8, the IQR), higher trust in the government (the blue line) 'boosted' the extent of support for the federal funding policy. The predicted levels of support for the funding policy increased by approximately 23% when the institutional trust shifted from low (the red line) to high (the blue line, technology support measure was held at the mean). Other than those values (the IQR), there were no significant differences as both confidence intervals overlapped. This analysis shows the combined effect of trust on support for public policies, especially how each element enhances the positive effect of the other.

6 Discussion

In this study, we address an important aspect in the current literature about technological innovations in healthcare. Previous work suggested that trust plays a role in how much individuals are willing to accept various treatments and adopt tools that are designed to improve their condition (Hall et al. 2001). Our analysis expands on those issues, mostly exploring how

trust in the institutions (Janssen et al. 2020; Priest 2003) that manage healthcare matters for supporting public policies that can expand the access of citizens to innovations in healthcare.

The results of our analysis offer substantial evidence that supports our main proposition. Namely, that trust is an important element in the attitudes of individuals when it comes to adopting technological innovations such as RPM devices for improved healthcare delivery.

Across all our statistical models, trust in institutions (government, private insurers) showed a consistent effect on respondents' attitudes. We find that higher levels of trust in managing organizations can lead to as much as 20% increase in the support for implementing policies such as funding by governmental agencies. Other results point to an increase of more than 10% in support for government drafting guidelines and managing practices for the distribution of RPM devices among eligible and in-need citizens. Our models also accounted for 'technological trust' - views about the effectiveness or usefulness of the technology overall (Lippert and Davis 2006) or specifically with respect to healthcare solutions (Hall et al. 2001; Li et al. 2016; Sun et al. 2013). The results suggested that institutional trust remains a powerful factor in shaping views even when accounting for respondents' levels of trust in the technology itself. As a whole, the results of our analysis correspond with recent work that showed how trust in managing organizations play a critical role in public attitudes about adopting technological solutions in the context of healthcare (Horvath et al. 2022; Fox and Connolly 2018).

Costs represent a central element in debates on using healthcare innovations, especially in the US (Peretz, Arnaert and Ponzoni 2018). As such, we incorporated it into our models and tested it as part of the analysis. We find that: (a) concerns for costs of using RPM are persistent among respondents; and (b) trust remains a strong predictor of attitudes even when considering the critical role of costs in accepting RPM technology. These findings reinforce the argument that trust is a central (and independent) factor in the attitudes of individuals when it comes to employing technological innovations in healthcare policy. In addition, defining a central role for governments in regulating the introduction of RPM technology into the marketplace can possibly reduce concerns about costs, and elevate the benefits of RPM devices as demonstrated in previous studies (Bowels et al. 2011; Mierdel and Owens 2015).

Our survey results showed the role of trust for a critical portion of the relevant stakeholder population. While most studies investigate public attitudes and show the positive effects among patients who adopted the technology (Di et al. 2021; Nissan and Lindhardt 2017), others point to the lack of data to conduct more systematic tests (Noah et al. 2018; Vegesna et al. 2017). We highlight the views of 'professional stakeholders' – a specific sub-sample of individuals who are likely to play a critical role in designing policies and implementing programs for a wide-scale distribution of RPM technology. We find that among this group of stakeholders, trust in the managing institutions as well as the technology itself are strong predictors of supporting various public policies that would enable expanded access and use of the technology for eligible public members.

7 Conclusions and Limitations

This study explores important research questions about the adoption of advanced technological innovations (RPM devices) to improve public healthcare. Primarily, we investigate how trust in managing organizations as well as in the technological solutions affect views about adopting and implementing expanded public programs to use RPM tools among public members.

Our work offers two contributions for the literature. First, we assess the views of professional stakeholders – mid-level managers and executives in organizations who are responsible to design, make funding decisions and administer wide-scale programs that leverage RPM devices for improved healthcare. By understanding their concerns, especially about public health plans, we can better assess what areas need improvement in order to create greater access to technological innovations to all populations in-need.

Second, our central explanatory factor is institutional trust - how much do individuals believe in the organizations that are expected to manage RPM programs? Our results show that the institutional aspect of trust should play a central role in our evaluation and understanding of adopting technology as a whole, and particularly in the area of healthcare.

Limitations and further research. Despite the insights of our study on trust and public policies in healthcare, it is still limited in several aspects and more work is needed. First, our sample includes participants from various organizations that relate to the implementation of healthcare

policy. Yet, there is a need for more diverse pool of professional and expert opinions such as social workers or individuals who deal with issues of access for minorities, and those who are not likely to be able to afford RPM technology. Those individuals can add insights about the specific hardships of these populations and expand our understanding of the necessary steps to make RPM devices accessible for all. Also, the attitudes of the manufacturers of RPM technology can provide a more complete view of the process from the production to the distribution of devices within the public health marketplace. Second, while our quantitative analysis of survey responses offers much in terms of general views of trust, effectiveness and policy support, more nuanced insights can be collected by employing methods such as interviews or focus-groups for stakeholders. Future work using such methods can explore particular aspects of federal RPM policy and provide specific answers to questions of adoption and implementation.

The technology of Remote Patient Monitoring faces both technical and behavioral hurdles to overcome if it will be successfully implemented as a core element of the U.S. healthcare system. A myriad of questions needs to be addressed before one can determine the implementation, acceptance and utilization of such devices by patients and healthcare providers. Our work contributes to this growing base of knowledge and offers the angle of professional stakeholders. Accounting for these individuals along with patients, clinicians, and technological experts can provide a more comprehensive picture of safe, effective and manageable ways to expand the use of this technology into our healthcare system.

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