

# Towards a holistic healthcare ecosystem

## Abstract

*The insurance-driven care model has failed to produce strong health outcomes in the developed world because of its inattention to preventive care and a tendency to prioritize for local optima (benefits that accrue in the near-term to a few individuals) in the care process. None of the current attempts to address this failing have worked well at scale. For improving outcomes, a fundamental shift in approach is needed, one that incorporates mechanisms to incentivize actors towards globally-optimal health decision-making. In this note, we suggest an approach which (a) enhances the role of care providers to incorporate proactive caregiving, and (b) replaces insurers with care intermediaries, entities that not only manage care financing but also play an active role in leading actors towards global optima in health. Care intermediaries use a new tool, called gamifier policies, which bring together different techniques from the space of micro-economics and behavioral economics for inducing behavioral change in ecosystem players. Developing countries like India are in a strong position to benefit from this approach, given the relatively low penetration of insurance here and the recent increase in political and market impetus for healthcare.*

## Introduction

India is in a unique position with respect to creating a national framework for healthcare delivery to its citizens. Digital data in health is just taking roots in the country, the health insurance industry is turning around profits and diversifying<sup>1, 2</sup>, and there is a noticeable increase in government interest and funding for healthcare. This is a great opportunity for rethinking the fundamentals of health service delivery and, in keeping with that thinking, building a robust healthcare technology framework for the country.

## The Problems with Insurance-Driven Care

Even with the increase in penetration of health insurance and government-led assurance schemes, we have to recognize the limitations of an insurance-driven care regime. Some of these are well-known in the developed world by now but hard to fix there for legacy reasons.

- 1. Sick-care not health-care:** Insurance-driven care, as practised in developed economies, puts a disproportionate emphasis on sickness, as opposed to the overall health and wellbeing of individuals. Healthcare is essentially equated with medical treatments given to sick patients i.e. treatments necessarily involve a consumer being in an unhealthy or sick condition before being treated. Doctors are paid in terms of the number of treatments they give as opposed to how healthy their consumers are in the long run. Globally, this view is being questioned and a shift is happening<sup>3</sup>. Modern healthcare delivery services are beginning to treat preventive care as an integral part of care delivery.
- 2. Delayed intervention:** Because of the disproportionate emphasis on sickness and on hospitalization episodes, insurance companies tend to be non-committal about paying for tests done to **detect**

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<sup>1</sup> liveMint, [The changing face of health insurance in India](#) (2017).

<sup>2</sup> India Brand Equity Foundation. [Healthcare Industry in India](#) (2018).

<sup>3</sup> IBX Insights. [Health Insurance Covers 100 Percent of Preventive Care. But What is preventive care?](#) (2018)

**diseases early** and less so, for rewarding consumer initiative for early detection. The value of early detection of diseases is well-established, especially for life-threatening diseases like cancer<sup>4</sup>. Still, insurers have stayed away from incentivizing consumer or provider efforts in that direction.

- 3. Procedure Inflation:** Even within the scope of addressing hospitalization episodes, insurance-driven care suffers from the problem of information asymmetry. Insurers are at a loss of information to determine whether a given consumer is in genuine need for the treatment that is claimed to be given by the provider. Providers, in the interest of maximizing profits, often choose to “over-treat” the consumer or to “inflate” the treatment procedure beyond necessity. For example, in the US, 30% of all surgeries performed are performed even before all non-surgical interventions have been explored<sup>5</sup>. This has the undesirable effect that healthcare costs spiral up even as the disease burden of the population remains high (medicational excesses lead to increased medical intervention).

## The Core Problem

While these three problems appear to be somewhat unrelated, they can be viewed as manifestations of a single core problem, which is that the insurance-driven care model steers all actors - providers, insurers and consumers - towards a short-term view in health decision-making. For any individual, in any situation and at any point in time, decisions about the individual’s health are taken with the objective of achieving good health (for the individual) and making a good financial gain (for the provider) in that situation and at that time, rather than with the objective of maximizing health for all individuals, in all situations and at all times, and maximizing gains for all providers in all situations and at all times. To put it differently:

**Health decisions in the insurance-driven care model try to optimize for an objective function that considers only the local optimum of health and financial gains rather than the global optimum.**

The global optimum in a healthcare ecosystem is achieved when all consumers in that ecosystem remain “healthy” for a “long” period of time and all providers earn “large” revenues over that period. While it is not possible to define this in precise mathematical terms, the distinction between a globally-optimal health decision and one that is not is often clear. Globally-optimal decisions are also more desirable than locally-optimal ones.

It is easy to see how the previously-stated problems are manifestations of this core problem. For any healthy individual (i.e., one without any sickness condition), the local optimum is already achieved, even though his global optimum may call for some actions like regular exercise and check-ups (preventive care) and disease screenings (early detection). But since the insurance-driven care model is about achieving local optima in health, insurers make little or no attempt to incentivize actors to take such actions. Second, for any individual who falls sick, achieving the local optimum means bringing the individual back to health quickly irrespective of how it may affect his long-term well-being or how it may affect other actors in the ecosystem (e.g., change healthcare costs). This results in phenomena like procedure inflation, which eventually raises costs for everyone in the ecosystem. The globally-optimal approach, on the other hand, would be to minimize medical intervention and take measures like treating surgery as a last resort. Finally, certain interventions, like disease screenings and health

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<sup>4</sup> Cancer Research UK. [Why is early diagnosis important?](#) (2018)

<sup>5</sup> M.D. Tayade, S.D. Dalvi. [Fundamental Ethical Issues in Unnecessary Surgical Procedures](#) NCBI: NIH. (2016).

trainings are essential for maintaining health of the entire population and reducing overall costs of care. But these are also locally sub-optimal in that they spend medical resources largely on healthy individuals. So again, insurance-driven care does not prioritize for them.

## Prior Approaches

There have been some attempts to address this problem in the developed world in the past decade. Several hospital systems, both State-owned and private, are beginning to emphasize quality over profits and adopting care models that improve outcomes while minimizing costs, in what is referred to as *value-based care delivery*<sup>6</sup>. However, uptake of such models is still limited and the traditional “fee-for-service” model, in which doctors are paid based on the number of procedures conducted (as opposed to outcomes) has proven difficult to dislodge in most countries<sup>7</sup>. A notable exception is seen in Kaiser Permanente (KP), a privately-owned integrated care system in the US, which has successfully implemented value-based care delivery using the idea of *capitation payments*. In the capitation payment approach, care delivery is organized around medical conditions over the full cycle of care and providers receive a fixed payment for every consumer for a set period of time, irrespective of whether the consumer seeks care in that period or not. This naturally reduces provider tendency for procedure inflation that is prevalent in fee-for-service care delivery. KP also actively implements preventive care practices and incentivizes both providers and consumers to undertake regular screenings<sup>8</sup> and the effects of some of these efforts have also been demonstrated<sup>9</sup>.

The KP system is unique in that it combines an insurer and a provider network under the same hood, a model that others have failed to replicate successfully<sup>10</sup>. As such, the reach of their model is limited (12 million members in the US, currently). It is also a closed system i.e. it is not interoperable with other provider networks which may provide value-based care. Our attempt here is to create an open system which permits insurer and provider separation, while enhancing their roles and which also works at country scale.

Capitation-based approaches have also worked successfully in other countries like Sweden<sup>11</sup>, the Netherlands<sup>12</sup> and the UK to limit healthcare costs and procedure inflation. However, the impact of these approaches on preventive care and early detection is not well-known and there are few systems which combine consumer and provider incentivization effectively to lead all actors towards globally-optimal care practices the way KP has achieved it.

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<sup>6</sup> Michael Porter. [Value-Based Healthcare Delivery](#). Harvard Business School (2009).

<sup>7</sup> The Economist. [Value-based healthcare: A global assessment](#) (2016).

<sup>8</sup> Kaiser Permanente Press Releases. [Kaiser Permanente Leads the Way in Prevention, Screenings](#) (2015).

<sup>9</sup> Lester et al. BMJ. [The impact of removing financial incentives from clinical quality indicators: longitudinal analysis of four Kaiser Permanente indicators](#) (2010)

<sup>10</sup> Bob Herman. [Is Kaiser the template for value-based care?](#) Modern Healthcare (2015)

<sup>11</sup> S. Larsson, P. Tollman. [Healthcare's Value Problem and How to Fix It](#). BCG Henderson Institute (2017)

<sup>12</sup> J. N. Struijs. [How Bundled Health Care Payments Are Working in the Netherlands](#) Harvard Business Review (2015)

## Our Objective

We need a fundamental shift in our approach to healthcare and resist the temptation to replicate the traditional insurance-driven care model from developed countries, as is. This calls for creating a new framework which incentivizes globally-optimal health decisions for all stakeholders and which is based on open standards and works at large scale. Our framework must bring about three types of changes:

1. ***A definitional change:*** First, we need a broader perspective on the notion of healthcare providers itself, one that incorporates entities other than doctors who contribute to the overall health of the population. We also need new entities to facilitate globally-optimal health decision-making amongst providers and consumers.
2. ***A technological change:*** Then, we need to develop a technology framework that supports entities in exercising their roles and, in particular, help ensure that health decisions are predicated on global optima. This framework has to go beyond increasing efficiency and patient-friendliness of clinical care into a realm where the “right care” is imparted to the “right consumer” at the “right time”<sup>13</sup>. Our framework should be minimal, yet powerful enough for the actors to innovate on actual solutions.
3. ***An adoption path:*** Finally, we need to set up an adoption path for both these changes. This would include enlisting the required regulatory intervention as well as market activation strategies.

## Redefining Healthcare Providers

As we design a new healthcare framework, we must first jettison the prevalent idea that doctors and hospital staff are the only ones who provide healthcare to individuals. This calls for incorporating several entities who are traditionally ignored in the definition of a healthcare provider, for example

- **Health coaches**, people who help healthy individuals remain healthy by giving them advice on and tools for health decisions. This includes fitness instructors, yoga teachers, dieticians and therapists who work on the health of individuals even before they fall sick
- **Community health workers (CHWs)**, people who advise groups of individuals on health decisions and provide information about good health practices. This includes ASHA workers and people involved in giving vaccinations, disease screenings or monitoring of medication regimens
- **Maternity care workers**, including maternity fitness experts, doulas and postpartum caregivers
- **Alternative medicine providers**, the so-called “AYUSH” practitioners, whose advice and intervention is often preventive in nature
- **Consumers themselves**, in their practice of self-care, with or without participation of other entities

Together with doctors, nurses and pharmacists, these people form the care support team of the consumer. Unlike doctors, though, these providers have no licensing norms or recognition metrics associated with them,

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<sup>13</sup> This covers a variety of different aspects of care: the idea that both curative and preventive care should be supported, the idea of timely intervention and early detection, the idea of ensuring care authenticity, and the idea of ensuring care fairness.

although this is slowly changing e.g., alternative medicine providers already have some recognition metrics<sup>14</sup> and self-care is becoming more and more data-driven.

To develop our framework, we focus on the roles that healthcare providers play in the consumer's care, rather than their labels. Broadly, there are two roles of healthcare providers:

1. **Proactive Care:** Any care given to the consumer before he or she falls sick is proactive care. This includes both **preventive care** (non-clinical care given before the onset of disease) and **disease detection** (clinical examination of a healthy consumer for detecting diseases). Preventive care could be given by health coaches, CHWs (when engaged in health education), prenatal caregivers or even doctors (doing health training). Disease screenings could be done by diagnostic lab staff, doctors or even CHWs.
2. **Reactive Care:** This includes any care given to a consumer after a disease has been detected or when the consumer, or someone on his or her behalf, reports a need for medical intervention. Reactive care can further be classified into two types: **curative care** (any form of medical treatments given to consumers) and **care monitoring** (monitoring of a treatment regimen assigned to a consumer). Curative care covers a gamut of interventions like OPD consultations, in-patient care, emergency care, lab tests, medication and any form of clinical or non-clinical care surrounding maternity. Care monitoring includes monitoring of chronic conditions (e.g., diabetes, TB, HIV), rehab procedures, etc. Both roles can be played by either doctors and their teams, CHWs, therapists or AYUSH practitioners.

The mapping from providers to roles is many-to-many: the same provider can play multiple roles in the consumer's care and a single role can be played by multiple providers.

## Care Intermediaries

The interaction between consumers and healthcare providers has several different components other than the aspect of physically giving and receiving care: the search for relevant providers, the selection of a provider, the communication between the consumer and the provider, the financial transactions between them and the management of data generated in the process. Care intermediaries are the entities that implement some or all of these processes.

Traditionally, insurers have been responsible for some of these processes, in particular the financial transactions around care, but with respect to a narrow definition of care -- curative care. We define for them a broader purpose, which is captured in our view of a care intermediary. In particular, our position is that care intermediaries will play a key role in ensuring globally-optimal health decision-making and healthcare delivery.

The roles of care intermediaries can be broken up into three parts:

1. **Care interfacing:** enabling consumers to select the right healthcare providers, gathering care preferences, redressing grievances and engaging consumers in proactive care and care monitoring. On

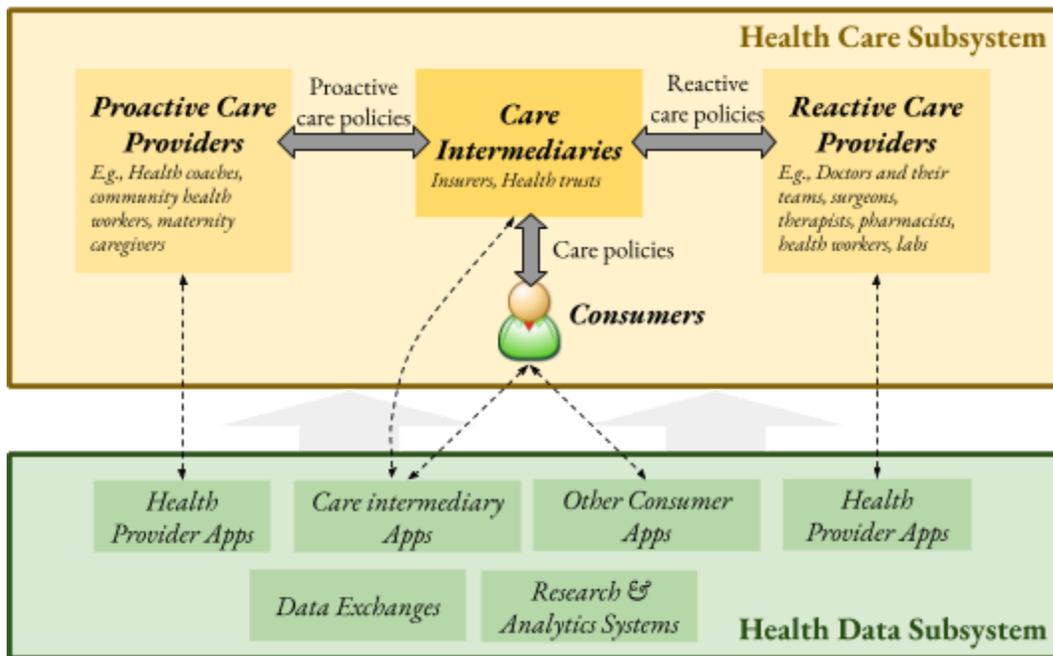
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<sup>14</sup> D. Shankar and B. Patwardhan. [AYUSH for New India: Vision and strategy](#). [J Ayurveda Integr Med](#). (2017).

the provider side, care intermediaries collect and organize data, including quality metrics, on providers and associated healthcare facilities (network management) and may also facilitate consumer selection.

- Care policy management:** creating healthcare policies, underwriting risk, administering care policies (including the financial transactions around care) and collecting care-related data in the process. On the provider side, intermediaries negotiate the price of care and facilitate payments. Care policy management is the main role that insurers play in the traditional insurance-driven care model.
- Incentive management:** setting incentives for both consumers and providers so that health decisions are made at both ends in a globally-optimal manner.

A care intermediary could either be a single entity playing all the above roles or a combination of entities each playing a different role. We expect that the role of incentive management may become specialized enough that it requires separate entities, possibly with regulatory support and/or State funding.



## Technology Framework

In our view, there are three technology building blocks that are needed to enable care providers and care intermediaries to play their role effectively.

- A Health Data Subsystem:** Health data needs to be digitized and made easily accessible to all actors, based on consumer consent. For intermediaries, data is critical at several different levels. They need health data about consumers to be able to do care interfacing effectively, for example, identifying consumers in need of proactive care, care monitoring and helping in the selection of suitable healthcare providers for consumers. They need health data to be able to create new health care policies and update

existing ones in keeping with overall requirements of the consumer population. And they need health data to be able to control for procedure inflation and detect deviations in caregiving practices<sup>15</sup>.

For providers, access to health data is critical in providing better care e.g., in clinical decision-making, in defining treatment regimens. Care customization relies on availability of health data about consumers.

- 2. Technology for Care Policy Management:** Care intermediaries need robust technology solutions for policy management and in particular, for various aspects of policy administration like claims processing and fraud detection.
- 3. Gamifier Policies:** Finally, care intermediaries need tools for creating and implementing incentive schemes. We provide a new mechanism which we refer to as gamifier policies and which we describe in detail next.

## Gamifier Policies

Gamifier policies are a new type of care policies which gamify health decision-making for healthcare consumers and providers and incentivize them towards achieving global optima of health. As a simple example, a gamifier policy may provide a monetary incentive (e.g., a voucher) to individuals to undertake at least one annual health checkup, which must include age- and demographic-appropriate screening tests. This is likely to drive consumer behavior towards participating in disease detection. As another example, a gamifier policy may specify a quality-controlled auction mechanism that can assist consumers in selecting a healthcare provider when they want care. This could incentivize providers to reduce the cost of care and keep procedure inflation under check. (Quality controls are needed to ensure that price is not the only determinant for provider selection.) This approach could apply equally well to proactive as well as reactive care.

## Gadgets

The building blocks for creating gamifier policies will be obtained from the economics literature. The micro-economics literature could provide tools for incentivizing providers to deliver quality of care (globally-optimal care) whereas that on behavioral economics could offer tools for incentivizing consumers towards optimal health actions. We refer to these tools or building blocks as *gadgets* and present a few candidate gadgets below.

- 1. Generalized Second-Price (GSP) Auctions<sup>16</sup>:** Second-price auctions are a well-studied type of sealed-bid auctions which satisfy incentive compatibility i.e. they have an inbuilt mechanism for incentivizing truthful bidding amongst players. There are several variations of second-price auctions

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<sup>15</sup> Health data by itself cannot address the problem of procedure inflation but will be an essential aid in the process. Historical data on patients can be used to identify glaring anomalies in treatments and may help detect instances of unnecessary surgeries.

<sup>16</sup> Edelman et al. [Internet Advertising and the Generalized Second-Price Auctions: Selling Billions of Dollars Worth of Keywords](#). The American Economic Review Vol 97(1) (2007).

one of which, namely, the GSP auction, is what is popularly used for selling advertisements (in particular, search ads) on the Internet. The GSP variant used by Google also includes controls for quality: here, ad listings are created not just based on advertisers' bids (ad with the highest bid listed at the top) but also based on other criteria like relevance to the search keywords and webpage quality of the advertiser. This ensures that advertisers with inferior or irrelevant products are unable to get listed just on the basis of large bids.

GSP auctions could serve as a gadget for provider incentivization in healthcare. An auction mechanism for provider selection (providers which offer cheaper care are more likely to be selected) could incentivize providers to keep their costs low and minimize the use of interventions. While care intermediaries cannot enforce the selection of a provider by a consumer, their recommendations can shape consumer choice over time and the use of an auctioning strategy for recommendations can, in turn, affect pricing. Of course, price cannot be the only criterion for selection, which is why we need a quality-controlled GSP mechanism, like the one used in Google search ads. Besides quality checks, care intermediaries may apply other filters for provider selection like a filter for location (proximity to consumer) and one for relevance (capacity to provide the required type of care).

2. **Stable Marriage and its Solutions**<sup>17</sup>: The stable marriage problem asks for finding a matching between two equally-sized sets of entities, say  $n$  men and  $n$  women, with a ranking of preferences for each other such that there is no man and no woman who prefer to be with each other more than with the entity they get matched to. Stable marriage and its variants are well-researched in the micro-economics literature and have multiple practical applications in market design, one of the most prominent ones being school choice systems for matching students to schools and universities in North America. Since the problem incorporates preferences on both sides of the matching (consumers as well as providers), and these preferences could change with time, it provides a good tool for simultaneously incentivizing behavioral change amongst consumers and providers. As such, the solution to the problem could serve as an effective gadget in gamifier policies for creating matchings between care consumers and care providers. If entities set their preferences from the standpoint of achieving global optima (consumers preferring providers who give high quality of care, providers preferring consumers who have a good proactive care record), then this could naturally lead the ecosystem towards global optima. Care intermediaries can play the role of collecting preference data on either side or providing suggestions for defining preferences<sup>18</sup>.
3. **Pay for Performance**: This is an incentive tool which originated in human resource management and is already in use in healthcare in some parts of the world. The idea is to give monetary incentives to entities in proportion to the performance outcomes achieved by them in their respective tasks. Pay for performance schemes have been implemented for the purpose of provider incentivization in the US and UK and with mixed results<sup>19</sup>. It is possible to extend their application on the consumer side, in

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<sup>17</sup> H. Meirson. [The Stable Marriage Problem](#). (1992)

<sup>18</sup> For mapping to the healthcare domain, suitable variations of the stable marriage problem need to be used. For example, since a single provider can simultaneously provide care to multiple consumers, we need a problem variant which permits polygamous (one-to-many) matchings.

<sup>19</sup> Health Affairs. [Pay-for-Performance](#) (2012)

particular, for incentivizing consumers to engage in proactive care or to increase their adherence to care regimens. The most challenging aspect of pay-for-performance schemes has been to arrive at meaningful notions of performance which lift the ecosystem towards global optima while still maintaining intrinsic motivation amongst participants.

4. **Tools to Counter Information Asymmetry:** Information asymmetry is a problem in markets where buying decisions have to be made quickly but where buyers have insufficient information to evaluate the quality of goods from face value<sup>20</sup>. Such markets tend to attract rogue sellers who take advantage of the asymmetry in the sellers' favor, thus upsetting the price of goods and services and eventually, their average quality. The used-cars market and the credit market in developing economies are classic examples of markets with information asymmetry. The problem has also been recognized in the space of healthcare, both on the consumer side (consumers and insurers having insufficient information about medical procedures, hence leading to procedure inflation) and on the provider side (insurers having insufficient information about consumers' history, hence leading to adverse selection).

Tools to counter information asymmetry essentially try to balance the asymmetry between buyers and sellers by making information about products (or proxies of such information) available to buyers. This takes the form of giving warranties or guarantees on products, building and attaching brand names to products, and licensing practices. Some of these could serve as gadgets for gamifier policies as well.

5. **Adherence tools:** Clinical adherence, and in particular, adherence for treatment regimens is a long-standing problem in the medicine and behavioral economics literature. Gamifier policies could incorporate some of the tools for clinical adherence as means for consumer incentivization. These tools include counseling and accountability measures (e.g., clinicians following up with patients on a regular basis to check for adherence), nudges and reminder protocols (e.g., sending SMS reminders or app notifications to patients for taking medicines) and financial incentives. In general, a combination of tools has been found to be more effective in achieving adherence than applying different tools in isolation<sup>21</sup>. Although these tools have been applied largely for care monitoring, they could be extended for incentivizing consumers towards proactive care as well.

- 5.1. **Commitment devices:** A commitment device<sup>22</sup> is a type of an adherence tool using which a person self-binds himself to a course of action which he believes is beneficial and which he believes he will not adhere to by default. Examples include making monetary contracts to follow an exercise schedule, or publicising the resolve to quit smoking in one's social network. Commitment *contracts* are commitment devices which involve a contract between two or more parties, one making the commitment and the rest helping enforce it. Commitment contracts could serve as a gadget in gamifier policies, with care intermediaries trying to enforce

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<sup>20</sup> G. Akerlof. [The Market for "Lemons": Quality Uncertainty and the Market Mechanism](#). Quarterly Journal of Economics (1970)

<sup>21</sup> O. Al-Ubaydli, J. A. List, D. LoRe, D. Suskind. [Scaling for Economists: Lessons from the Non-Adherence Problem in the Medical Literature](#). Journal of Economic Perspectives (2016)

<sup>22</sup> G. Bryan, D. Karlan, S. Nelson. [Commitment Devices](#). (2010)

consumer adherence to care plans or regimens and with consumers being the committing entity.

In theory, most of these ideas around incentive tools are well understood but there is uncertainty on how well they work in practice, especially in terms of incentivizing behavioral change in healthcare. To address this problem, we propose an experimentation framework around gamifier policies in the next section.

## Experimentation Framework for Gamifier Policies

We have prepared a list of candidate gadgets for creating gamifier policies and it is possible to add more to this list in the future. Each of these gadgets can be represented in machine-readable formats (we give some examples below) and each of them allows for different possibilities of parameter tuning and adjustments.

To be able to evaluate gamifier policies and to assess their effectiveness in leading the ecosystem towards globally optimal health decision-making, we propose that a national-scale experimentation framework be created. This experimentation framework would be managed by a healthcare regulator and would engage care intermediaries in creating and launching new policies, testing them and learning from outcomes of different policy experiments. We highlight a few key aspects of this framework below.

1. **Standardization:** The framework would include a standard for creating gamifier policies and, in particular, for representing policy gadgets in machine-readable format.
2. **Flexibility in policy creation:** The framework would provide intermediaries the flexibility to tune the parameters of policy gadgets and to adapt the standard in several ways (e.g., add more parameters to a policy gadget). Policies can be created by amalgamation of different gadgets, each with different parameter settings. This allows for the creation of a large number of gamifier policies and thus, a large number of experiments around these policies.
3. **Customization levels:** The framework would also include some standards and guidelines for running different policy experiments. Broadly, policy experiments can apply policies at three levels:
  - a. They could target a specific segment of consumers or providers and apply gadgets in order to induce changes in that target segment.
  - b. They could customize segment-specific policies at the level of an individual consumer or provider (e.g., fine-tuning a regimen adherence gadget for specific consumers)
  - c. They could operate at population scale and define rules that apply to all consumers or all providers in the country.

All three types of policy experiments have to be incorporated in the framework.

4. **Policy auditing:** The framework must provide the regulator an ability to do continuous audits of all gamifier policies in order to ensure that (a) policies do not incentivize undesirable behavioral changes (e.g., giving a financial incentive to cancer patients for smoking cigarettes); and (b) policies do not induce unfair care practices (e.g., applying different financial incentives to consumers within the same target segment)
5. **Data collation:** The experimental framework must also provide ways to collect reliable data from different policy experiments and thus to assess the effectiveness of each policy. This would enable care intermediaries to learn from each others' experiments and would allow for effective policies to get to

population scale faster. The data exchange mechanism should provide tools to preserve privacy of sensitive attributes (like the parameter values used by intermediaries in successful experiments).

## Examples of Gamifier Policies

As a first step towards the creation of our experimentation framework, we drill a level deeper into the idea of gadgets and give some concrete examples. These examples include some indicators of what machine-readable representations of policies would look like.

### Example 1: Auctions for Provider Selection

One approach to incentivize providers towards globally-optimal care decision-making is to make provider selection competitive in terms of the price and the quality of their offerings. This is what auctions accomplish. We give an example of an auction-based provider selection policy based on the idea of GSP auctions. This policy applies to curative care only; adapting it to preventive care is straightforward.

1. As part of the policy, the care intermediary sets lower and upper thresholds on the price for different treatments
2. Over time, the intermediary calibrates providers on quality measures and assigns a dynamic *quality score* to each provider with respect to each treatment. The initial score of a provider is computed based on
  - a. academic qualifications of the provider
  - b. results from peer interviews with other providers, gauging professional capacity to provide the given treatment
  - c. quality assessment of the facility where the provider practices; this may involve physical inspection of the facility and factoring in accreditation information

Quality scores are updated on an annual basis based on

- a. consumer feedback on each instance of treatment provided by the provider
  - b. health outcomes from each instance<sup>23</sup>
3. For each treatment request from a consumer, the intermediary invites different providers to bid for the treatment request with a price offering. After filtering for providers whose bids fall within the pricing thresholds defined by the intermediary and who operate at most 20 km from the location of the consumer, the intermediary assigns to each of them a *ranking score*. This score is set as the product of
    - a. The quality score of the provider
    - b. The upper threshold for the price of the treatment *minus* the bid of the provider
  4. The intermediary presents the list of providers to the consumer in decreasing order of their ranking scores.

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<sup>23</sup> The mechanics of steps #1 and step #2 (price thresholding and quality scoring) are complex and are beyond the scope of this note. We expect that any system which applies the auction approach for provider selection will need to bootstrap from an imperfect state (where price thresholds are set for very few conditions, and quality scores have huge margins of error) and gradually improve as more data is generated from treatments.

- If the consumer selects the  $i$ th provider in the list of presented providers, the price of the treatment is fixed as the bid of the  $(i+1)$ th provider in the list. This is done to ensure incentive-compatible bidding, just as in the case of GSP auctions.

A possible structure for a machine-readable representation of this policy is as follows:

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care-classification: curative-care
conditions: ALL /* this policy is applicable to all conditions/diseases */
care-process: provider-selection
gadget:
  type: gsp-auction
  parameters: max-price ( ), min-price ( ), quality-score ( ), bid ( ), loc ( )
  /* max-price and min-price are functions that map treatments to price values; defined by the intermediary */
  /* quality-score maps a pair (p, t) to the quality score of the provider p wrt the treatment t. It is updated annually
  */
  /* bid maps a pair (p, t) to the price quoted by provider p for treatment t. It is reset whenever a new bid happens */
  /* loc maps a consumer or provider to their respective location coordinates */
  filters:
    filter:
      parameter: distance ( loc ( provider ), loc ( consumer ) )
      max: { unit: km, value: 20 }
    filter:
      parameter: bid ( provider, treatment ),
      max: max-price ( treatment ),
      min: min-price ( treatment )
  scoring-function:
    quality-score ( provider, treatment ) * ( max-price ( treatment ) - bid ( provider, treatment ) )

```

### Example 2: Reminders and commitment contracts for regimen adherence

Our second example demonstrates how care intermediaries would use regimen adherence tools for consumer incentivization. This applies to any kind of care where a consumer engages with the same provider in a series of interactions, with the objective of attaining a health goal (e.g., achieving a body weight target or getting cured of type-2 diabetes).

- As a first step, providers who have the ability to administer regimens for the given disease submit a set of regimens each to the care intermediary. For example, for type-2 diabetes, there could be different regimens corresponding to different severity levels of the disease; for weight reduction, there could be different regimens for people with or without thyroid disorders. The provider who submits a regimen is referred to as the *owner* of that regimen.
- For each regimen, the intermediary, along with assistance from the regimen owner, prepares a set of *enforcement plans*. An enforcement plan (see example below) is a protocol which uses a combination of gadgets to enforce adherence of the regimen. Each enforcement plan includes the usage parameters of

each gadget that it utilizes (e.g., for a financial incentive gadget, the amount and schedule of the financial incentive is specified).

3. When the consumer requests to be treated to a regimen, the intermediary obtains the health history of the consumer (either directly or from digital health records), which enables identification of a set of regimens that are applicable to that consumer.
4. The intermediary presents the set of applicable regimens for selection by the consumer. For the selection process, the intermediary may apply a provider selection protocol that utilizes a provider incentivization tool.
5. Once the regimen selection is complete, the intermediary selects an enforcement plan from the set of enforcement plans associated with that regimen and applies it to the consumer. This selection could be done randomly or using an algorithmic approach defined by the intermediary.

#### *An enforcement plan for a type-2 diabetes treatment regimen*

We now give a concrete example of an enforcement plan. This example uses a combination of reminders and commitment devices to enforce adherence of a treatment regimen for type-2 diabetes. We assume a one-year treatment regimen, which includes daily medications, monthly self-managed tests and quarterly visits to a doctor.

1. At the beginning of the plan, the consumer commits to a goal of achieving an HbA1c target of 7.5%. Towards this, the consumer enters into a contract with the intermediary wherein
  - a. The consumer agrees to receive a 20% discount on his annual care fees (e.g., premium) if the health goal is achieved and to pay a 20% penalty if the health goal is not achieved. This models a commitment contract between the consumer and the intermediary<sup>24</sup>.
  - b. The consumer agrees to submit results from the quarterly doctor visits to the intermediary
  - c. The consumer provides a list of people in his social network, with corresponding contact addresses, who are notified about the goal and the progress made towards the goal every quarter. This models a social commitment device that the consumer binds himself to.
  - d. The consumer agrees to receive reminder SMSes and calls from the intermediary at various stages of his regimen.
2. The intermediary notifies all people in the consumer's network about the health goal and the commencement of the enforcement plan
3. On a monthly basis, the intermediary sends SMS notifications to the consumer to remind him about the monthly self-managed tests
4. On a quarter basis, the intermediary sends a reminder SMS to the consumer to remind him about the upcoming doctor visit and follows up with reminder phone calls until the visit is complete
5. Results from each doctor visit (lab test results, doctor notes, prescriptions) are submitted in digital format to the intermediary. The intermediary processes these (e.g., extract the HbA1c value) and shares the processed results in the social network of the consumer.
6. At the end of the year, post the final doctor visit, the intermediary assesses whether the health goal has been achieved or not and accordingly decides the payout that is due to or from the consumer.

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<sup>24</sup> The 20% penalty or discount is a simplistic example. A good reward function should reward genuine attempts from the consumer even when the goal is not achieved. Also, the reward could be more closely tied with "adherence" rather than the achievement of a goal.

A possible structure for a machine-readable representation of this enforcement plan is given below.

```
care-classification: care-monitoring
conditions:
  condition:
    name: diabetes-type2,
    code: ... /* code would be a unique code for type-2 diabetes */
    severity: medium
    age: {unit=year value:10} /* age of the condition in the patient */
care-process: regimen-enforcement
regimen: http://ahospitals.com/regimens/1234xyzw/ /* URI for a JSON/XML object describing the regimen */
regimen-duration: {unit:year value:1}
health-goal:
  parameter: { type: diagnostic-test, name: hba1c, code: ... } /* code would be a unique code for the HbA1c test */
  target-value: 7.5
gadget:
  type: commitment-contract
  parameters:
    success-terms: {type: premium-discount value:20 unit:percent}
    failure-terms: {type: premium-penalty value:20 unit:percent}
gadget:
  type: social-commitment-device
  parameters:
    list-of-friends: {friend: {name: ... contact: ... } friend: { name: ... contact: ... } ... }
    notification: {medium-type: SMS, event: regimen-start, parameters: {list: {hba1c, ... } } }
    notification: {medium-type: SMS, event: doctor-visit, freq: quarterly, parameters: {list: {hba1c, ... } } }
    notification: {medium-type: SMS, event: regimen-end, parameters: {list: {hba1c, ... } } }
gadget:
  type: reminders
  parameters:
    reminder-list: {
      reminder: { medium-type: SMS, event: medication-1, freq: daily, parameters: { med-name: ... } }
    }
    reminder: { medium-type: SMS, event: self-test, freq: monthly, parameters: { test-name: ... } }
    reminder: { medium-type: SMS, event: doctor-visit, freq: quarterly, parameters: { ... } }
    ...
  }
```

The costs of implementing the enforcement plan will depend upon adherence rates. Intermediaries can tune the monetary payouts (premium discounts) based on the adherence rates and can adjust the care fees charged to consumers from time to time based on the overall costs that are incurred.

## Conclusion

The insurance-driven care model has failed to produce strong outcomes in the developed economies because of its disproportionate emphasis on sickness and curative care and because its prioritization of local minima over global minima in health decision-making. In this note, we have put forth a new approach to address this problem with the insurance-driven model. Our approach calls for replacing insurance providers with care intermediaries who, along with playing their care financing role, must also incentivize care providers and consumers towards taking globally-optimal health decisions. Intermediaries use a new tool called gamifier policies, which combine techniques from microeconomics and behavioral economics for implementing incentive solutions.

There are four aspects of our proposal which require a deeper investigation in the future.

1. **Defining the adoption path:** First, work is needed in charting out the adoption path for our approach. This requires enlisting regulator support, setting up the health data subsystem and institutionalizing the idea of care intermediaries (will today's insurers step up to play the role of care intermediaries or will this require creation of a new set of entities?). On the front of proactive care, work is needed to establish recognition metrics for preventive care providers so that gamifier policies can meaningfully include them.
2. **Architecting the framework:** Once regulator support is enlisted and care intermediaries are created, experimentation with policies will be key. We invite architects to help us create our experimentation framework, laying down the standards for writing gamifier policies and building the systems required for policy auditing and data management. For realizing the full benefit of gamifier policies, we need a flexible and scalable framework which allows for rapid experimentation with millions of policies simultaneously, and which interfaces with the health data subsystem for assessing impact.
3. **Refining policy gadgets:** At this point, we have no evidence to suggest which of our candidate gadgets are most suited to healthcare use cases, and which others ought to be added. The list of policy gadgets needs to undergo constant evolution, which will happen alongside the policy experiments.
4. **Addressing corruption:** As we progress on our adoption path, we need measures to defend the ecosystem from corrupt practices. Collusion between care intermediaries and providers to deliver inappropriate or unneeded care to consumers can completely defeat the purpose of a good policy infrastructure. Even when care intermediaries are honest, corrupt providers can pose impediments on the path to global optima<sup>25</sup>. Institutionalizing consumer feedback (through mechanisms like consumer review forums) may help address some of these concerns but we also need strong policing measures and tools that can assist the regulator and the consumers in enforcing integrity amongst providers.

The journey to a holistic healthcare ecosystem is long but it must be taken if we are to save healthcare from the ill-effects of capitalism. India is strongly positioned to take this journey to fruition because insurance-driven healthcare is still in its early stages here, and at the same time, the political will and energy to transform

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<sup>25</sup> Quartz.com. [Indian doctors are bribing colleagues, ambulance drivers and even yoga teachers to get patients](#). (2017)

healthcare is at its peak. If we act early and if the best technologists participate to design a robust digital health infrastructure for the country and in creating tools that can aid and incentivize good healthcare practices, it can have a long-lasting impact on health indicators of the country and, eventually, its economic well-being.