

market & revenue analysis

clinical evidence gives more than hope...



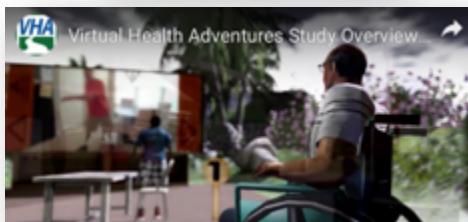
SimCoach: “virtual human” assess US Service Personnel for symptoms of PTSD.

- *“Individuals are **more comfortable disclosing to an automated virtual human interviewer** than its human counterpart.”*



Boston University Medical Center “Louise the Virtual Nurse” Project

- *“74% of hospital patients said they preferred receiving their discharge instructions from the virtual nurse, rather than their human doctors or nurses.”*
- *“It’s more helpful than talking to a person; it’s just like the nurse...”*



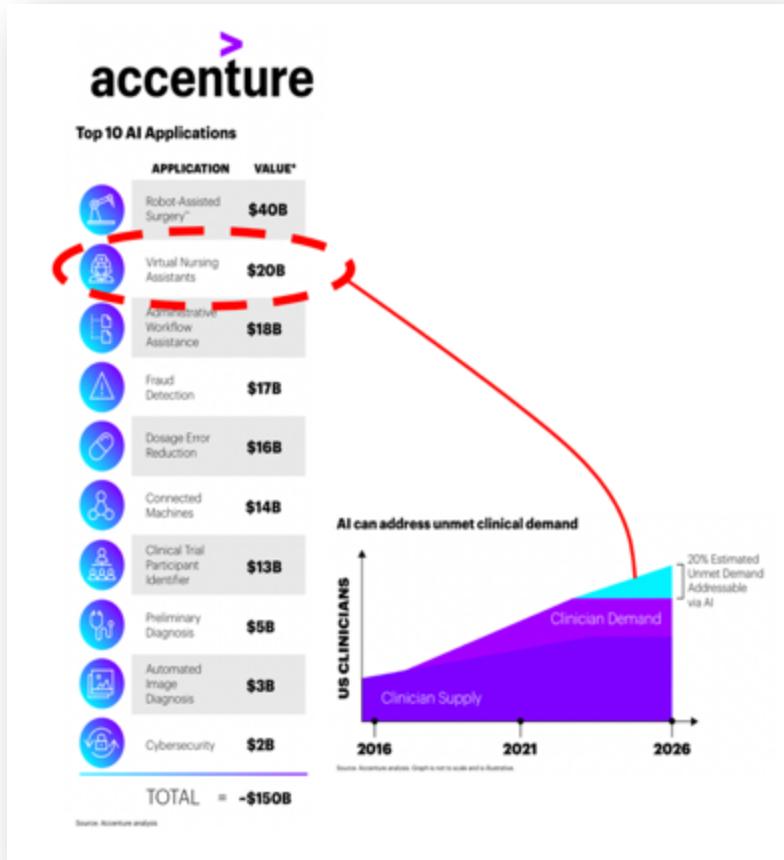
VA Virtual Health Adventures used avatars in virtual world for amputee rehab for service personnel

- *“Scientific evidence that **what the avatar does, translates to real life.**”*

global virtual nursing assistant market

...\$20B value

to the US healthcare economy by 2026...



through co-design... a unique capability in healthcare

- **World first corpus** of heart health conversations
universally applicable
- Corpus common to **other health domains**
- **Overcomes health illiteracy**, scale and
accessibility barriers
- **Co-designed** from the health illiterate patient
experience
- Embodied human-like conversational interface,
uniquely achieves both anonymity and rapport,
building **empathy** and **trust**
- Omni-channel & virtual worlds concepts

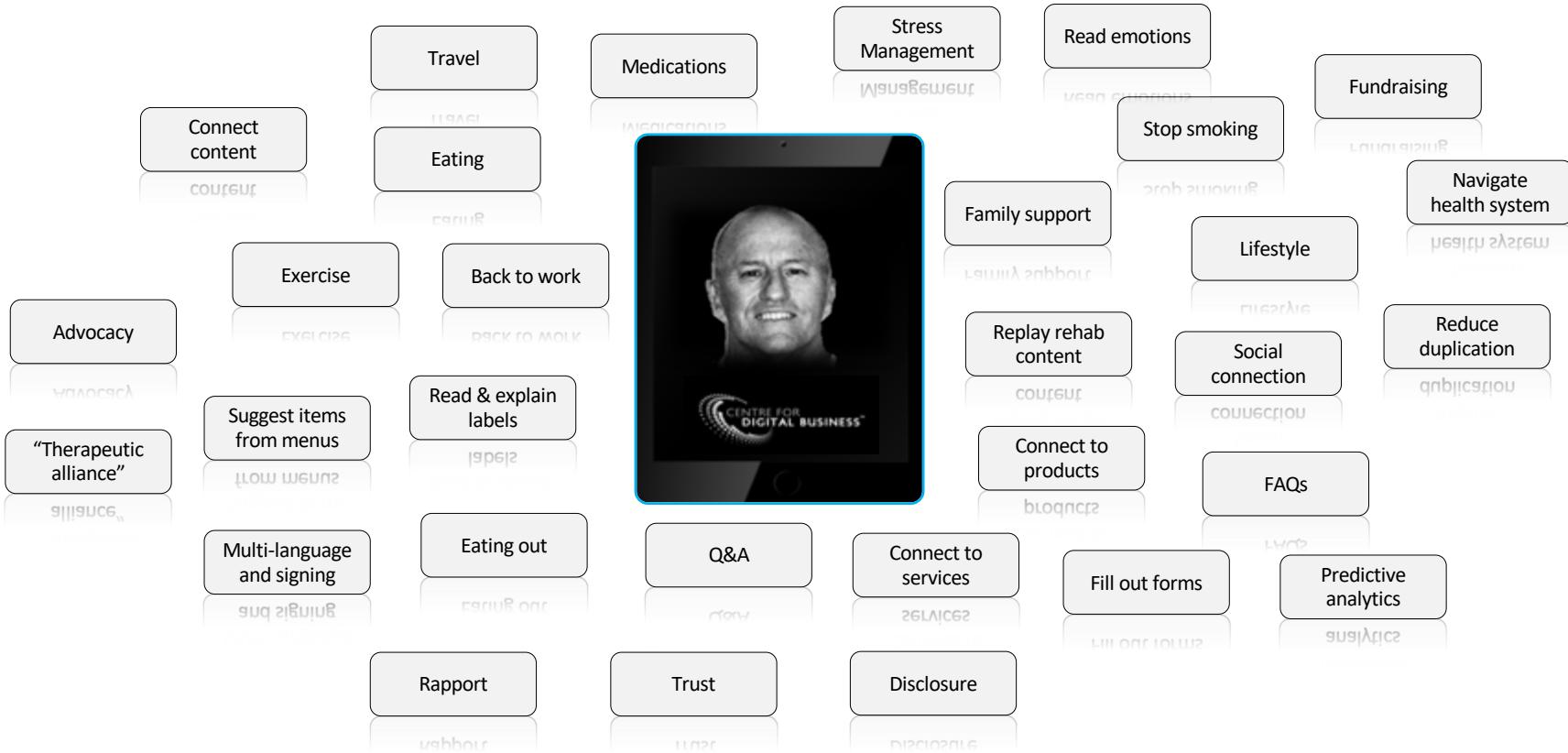


co-design... “*nothing about me, without me*”



“A lot of future **search** is going to be about **pictures instead of keywords**.”
Ben Silbermann, Pinterest Founder CEO 2017

what can the digital human cardiac coach do?



economic model for digital human cardiac coach

Initiative	Rationale	Patient Beneficiaries	Patient Benefits	Societal Beneficiaries	Societal Benefits
• Consolidation of creation, management and updating of CR information and education materials in [D H] AI	<ul style="list-style-type: none"> Information and education content largely common across all geographies and ethnicities Differences largely non-clinical (e.g. foods and recipes, local names of global brand medications) Sometimes hundreds of organisations creating, managing and updating CR information and education that is unique to their delivery program Consolidation and economy of scale enables creation of accessible and multi-language materials 	<ul style="list-style-type: none"> All patients Ethnic patients Patients of disability 	<ul style="list-style-type: none"> Higher standard of CR materials Advice regularly updated 	<ul style="list-style-type: none"> Private health funds Government funded health programs Hospitals 	<ul style="list-style-type: none"> Reduced information management costs Consistency to high standard Less legal risk Standard 'big data' supporting R&D
• [D H] delivery of common CR information and education	<ul style="list-style-type: none"> Many ethnic groups poorly represented in CR because materials and presentations only in English Location often an impediment to patients attending classes – 'fixes' such as manuals and web content lack empathy and feedback mechanisms Presentation of materials takes allied health professional away from clinical duties Budgets limit patients to one attendance at each session, can't access after graduating CR 	<ul style="list-style-type: none"> Ethnic groups other than English Patients who can't attend classes – locality, mobility etc All patients 	<ul style="list-style-type: none"> Higher standard of CR delivery Increased access to CR programs Improved health outcomes 	<ul style="list-style-type: none"> Governments & health funds Hospitals / allied health Employers 	<ul style="list-style-type: none"> Reduction in future heart health events and associated claims/costs Reduction in staff time off costs for employers More allied health hours available for clinical
• [D H] delivery of common CR information and education can begin at diagnosis or hospital admission	<ul style="list-style-type: none"> Information delivery and education can commence at diagnosis (better preparing patients for hospital) or admission (better preparing patients for the recovery and CR periods) Can deliver early coaching to start dealing with psychosocial implications 	<ul style="list-style-type: none"> Ethnic groups other than English, remote locality patients Patients at risk of anxiety and depression All patients 	<ul style="list-style-type: none"> Improved surgical and CR outcomes Decreased adverse psychosocial impacts 	<ul style="list-style-type: none"> General practitioners Hospitals 	<ul style="list-style-type: none"> Reduced GP workload in communicating and monitoring preparations Patients presenting to hospital are better prepared, reduced nurse workload
• [D H] role in primary and secondary prevention	<ul style="list-style-type: none"> Integrated delivery of information and education for heart health Q&A support for patient questions Accessible recording of exercise, diet etc Monitoring and reminders for medications, blood test, inoculations etc Delivery of sponsored or subscription exercise programs, meal planning and recipes etc 	<ul style="list-style-type: none"> All people at risk of or suffering from heart disease 	<ul style="list-style-type: none"> Increased heart health and quality of life Reduce incidence and costs of requiring surgery 	<ul style="list-style-type: none"> Society as a whole 	<ul style="list-style-type: none"> Decrease burden and cost of poor heart health, cardiac events and interventions / treatments Free up budget for other chronic diseases
• [D H] role in addressing other adverse cardiac impacts	<ul style="list-style-type: none"> Some CR programs emphasise the need for vocational (return to work) support Navigation of rules and regulations relating to driving including restrictions for various heart conditions and interventions, more regular medical checks for driving licenses etc Finding heart healthy foods etc when dining out or travelling Sourcing suitable community exercise programs Empathetic support when away from family (living alone, travelling for work etc) Assistance and advice on flying, travel insurance, taking meds overseas etc 	<ul style="list-style-type: none"> All patients Families of heart patients 	<ul style="list-style-type: none"> Faster integration back into home and community life Reduce frustration in navigating increased government and insurance regulations 	<ul style="list-style-type: none"> Employers Other service providers 	<ul style="list-style-type: none"> Faster more effective return to work of employees Opportunities for service providers to promote relevant goods and services to heart patients

the business case...the burning platform

Deaths

- Globally: 17.9 million pa - pandemic
- US: 840,000 pa
- UK: 170,000 pa
- Australia: 43,500 pa
- NZ: 33% of all deaths

Number of people with CVD

- Globally: 350,000,000
- US: 70 million; 1.255 million heart attacks pa
- UK: 7.4 million
- Australia: 4.2 million; 57,000 heart attacks pa
- NZ: 186,000

Health Illiteracy

- US: 90 million people health illiterate
- US: indigent and minorities >80%
- UK: 5 million adults "functionally illiterate"
- Australia: 60% adults deficient health literacy.
- NZ: 80% Maori males and 60% Maori females poor health literacy.

Litigation

- US: hospitals spend between \$173 million pa and \$624 million pa on legal fees defending poor communication
- US: average 250-bed hospital: \$1 million pa legal fees defending
- Poor communication (31%) one of top three contributing factors to MPL

Projections

- Globally: by 2030: 23.6 million deaths pa
- US deaths: next 20 yrs: 30% increase people with CVD, 130 million people, 45% population
- US: by 2035 CVD costs \$1.1 trillion pa

CVD Cost

- US: Additional CVD costs due to health illiteracy = \$29 b pa
- US: 2016: \$555 billion pa
- Australia: \$8.8 billion approx. 12% total health expenditure

Readmissions

- 30% patients have unplanned readmissions
- US: 30 day-readmissions rate 16.1%
- Australia: 30-day readmission rate 16.7%

the digital human cardiac coach

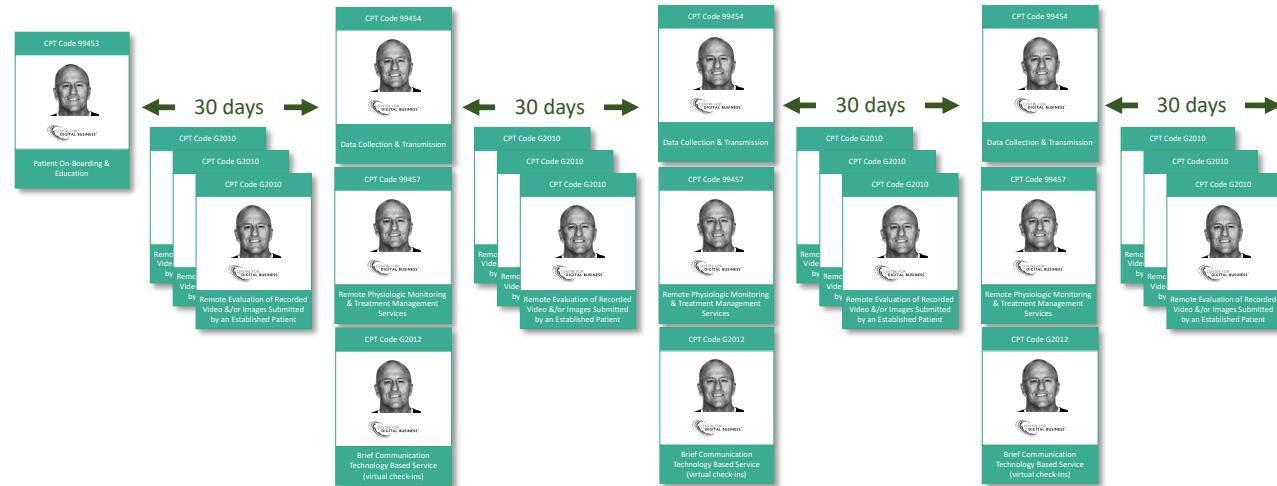
modelling of revenue from new CMS Codes

on a 90-day use case

DHCC capability mapping to CMS codes across the patient journey

The DHCC (and other DH health coaches) can be used across the patient journey: in-hospital; outpatients; in-home and beyond.

The DHCC services are now able to be covered by new CMS codes in the US, to support remote monitoring, data evaluation, care management and virtual check-ins



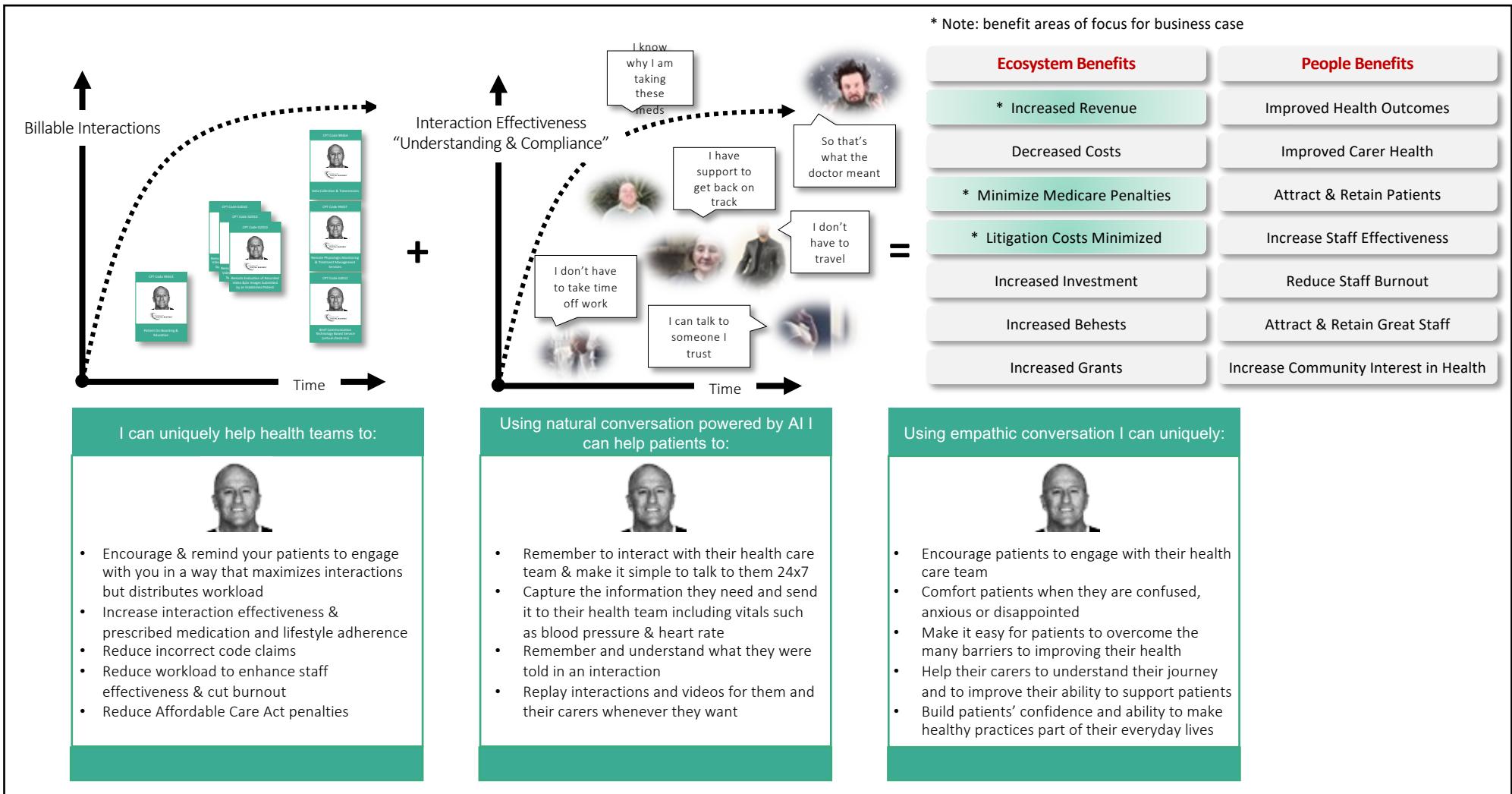
CMS code revenue model:

Maps to the use case of a single patient interacting with the DHCC over 90 days:

- Onboarding
- Physiologic recording & transmission
- Remote monitoring of physiologic data – interactive communication with patient
- Sending and evaluation of images re symptoms
- Virtual check-in

CODES	COMMENT	30 DAYS	60 DAYS	90 DAYS
CPT CODE <u>99453</u> - ONBOARDING		21.00		
CPT CODE <u>99453</u> - PHYSIOLOGIC DATA COLLECTION & TRANSMISSION		69.00	69.00	69.00
CPT CODE <u>99457</u> - REMOTE PHYSIOLOGIC MONITORING TREATMENT MANAGEMENT SERVICES		54.00	54.00	54.00
HCPCS CODE <u>G2010</u> - REMOTE EVALUATION OF IMAGES	SCENARIO - TWICE PER MONTH (NO FREQUENCY LIMITATIONS)	13.00 13.00	13.00 13.00	13.00 13.00
HCPCS CODE G2012 - BRIEF COMMUNICATION TECHNOLOGY-BASED SERVICE - "VIRTUAL CHECK-IN"	SCENARIO - TWICE PER MONTH (NO FREQUENCY LIMITATIONS)	15.00 15.00	15.00 15.00	15.00 15.00
MONTHLY TOTAL		200.00	179.00	179.00
90 DAY TOTAL				558.00
NOTE: THIS SAMPLE MODEL IS FOR A SINGLE PATIENT OVER 90 DAYS				

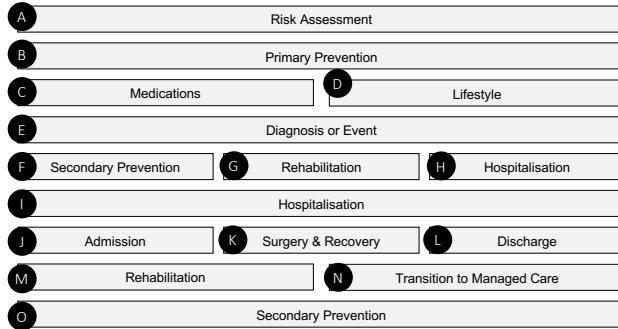
digital human cardiac coach maximizes the potential benefits of



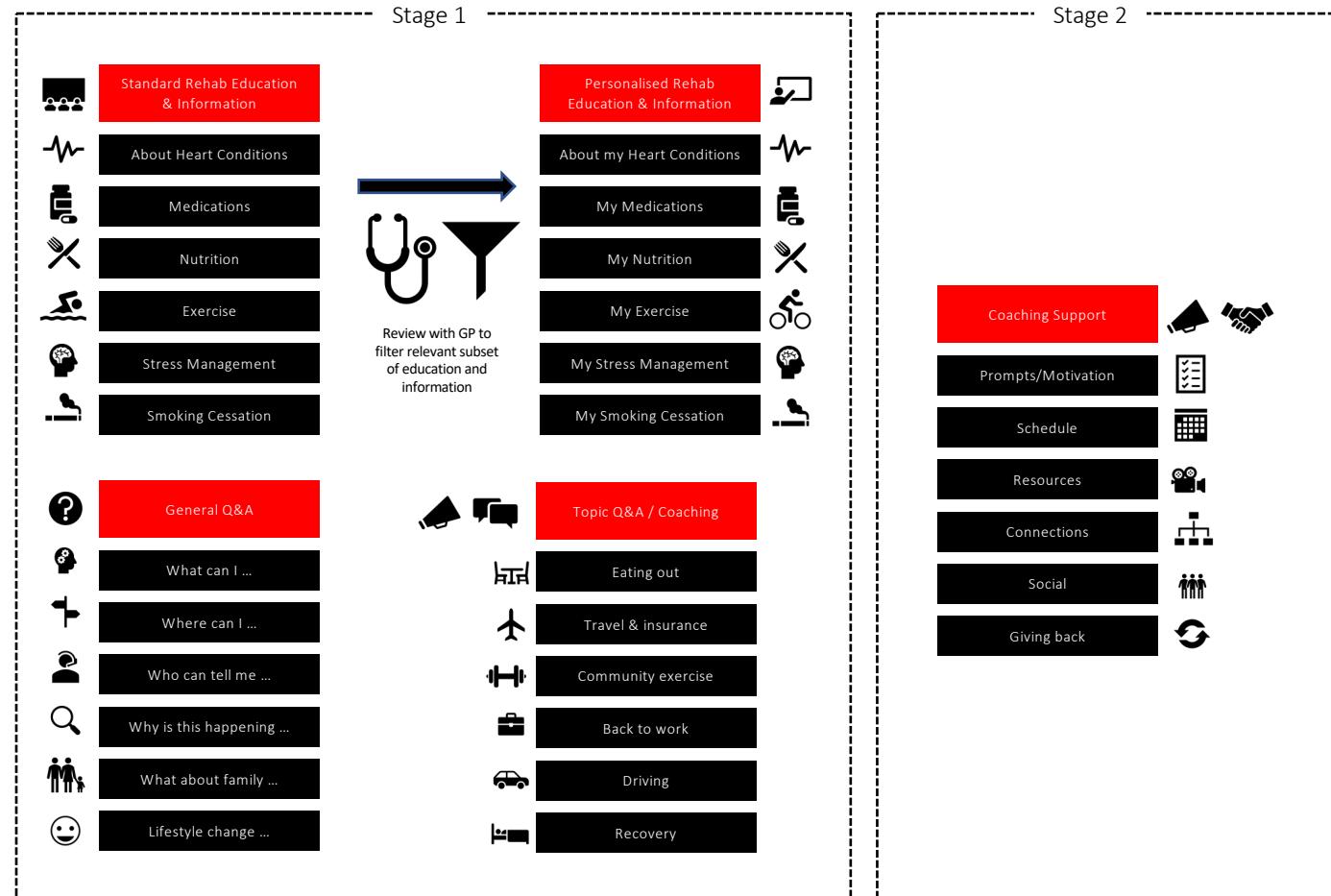
planning for deployment
based on prioritisation and
revenue

CMS codes | cardiac lifecycle and DHCC functionality

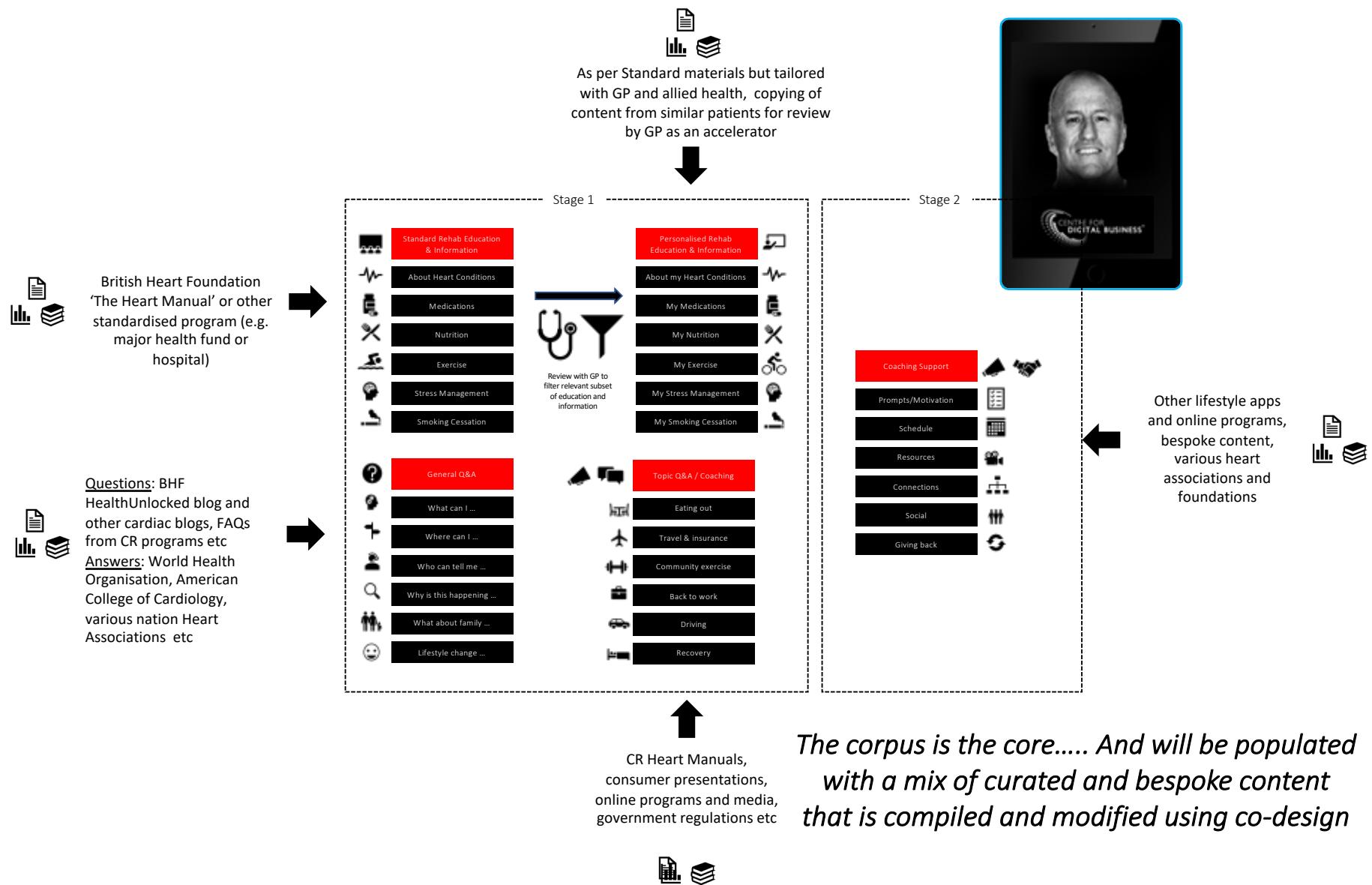
| Code | |
|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|
| Description | |
| Minimums | 40mins/month |
| Frequency | As required |



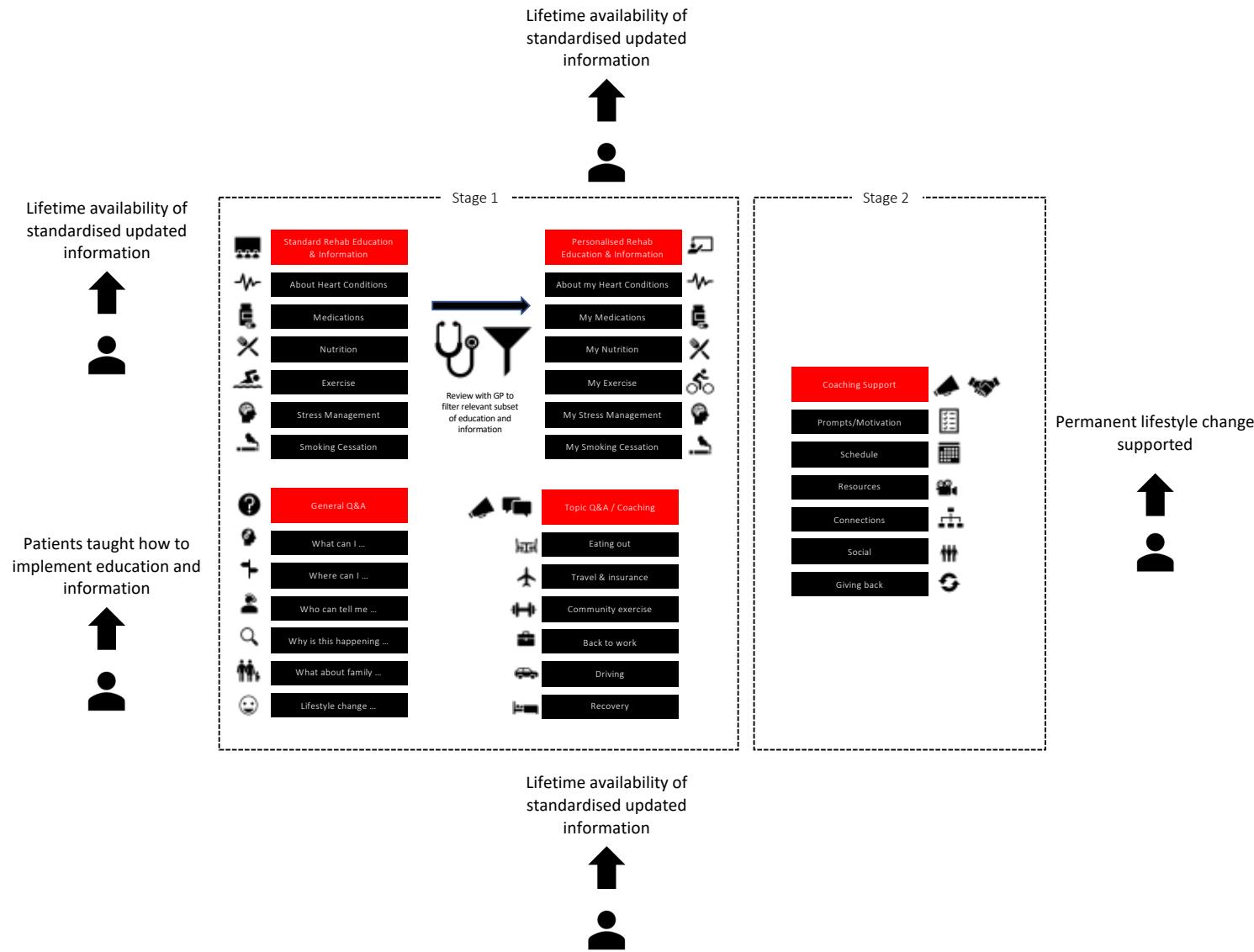
planning for deployment based on prioritisation & revenue



corpus components and sources of content



patient benefit model





\$HP

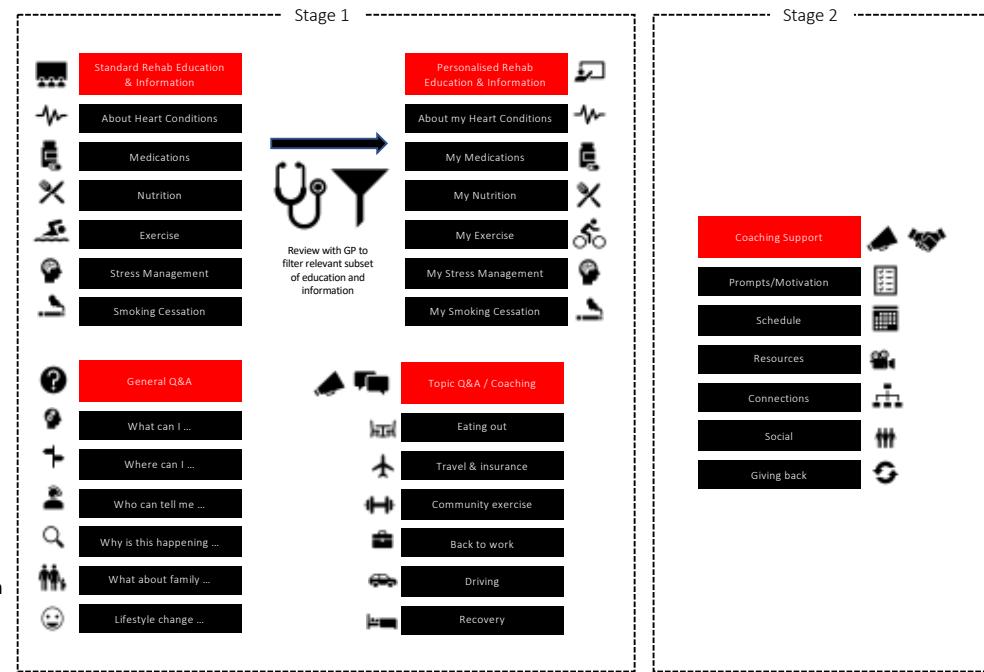


Cost of creating, managing and delivering standard cardiac rehabilitation information and education

\$DHI



Revenue from providing [D|H] to health provider.
White label to larger organisations such as health funds.



\$HP



Frequency of repeat cardiac events and surgeries reduced

link to revenue model

[D|H]
1

Digital human with feature support for video, images and text used to display information in addition to voice response

[D|H]
2

Digital human with full feature support and voice response

[D|H]
3

Empathic digital human with full feature support and voice response plus accessibility focussed facial design

[D|H]
4

Empathic digital human co-designed for a specific brand or cause with full feature support including subscription materials and ads

[D|H]
5

Simple Q&A via voice and text that accesses information and education materials from the corpus.

Simple Q&A via voice and text that accesses information and education materials from the corpus – English only

Q&A via voice and text that accesses information and education materials from the corpus – multi-language.

Q&A via voice and text that accesses information and education materials from the corpus and provides coaching – multi-language and sign language support.

Coaching focus spanning education, information, motivation,

Simple Q&A via voice and text that accesses information and education materials from the corpus.

Corpus is manually loaded and updated with Q&A, information and education materials.

Manual upload and update of corpus with AI assisted translation.

Manual upload and updating plus supervised machine learning.

Adds remote content capture to build corpus and respond to queries.

Simple Q&A via voice and text that accesses information and education materials from the corpus.

peripherals & machine vision for digital humans

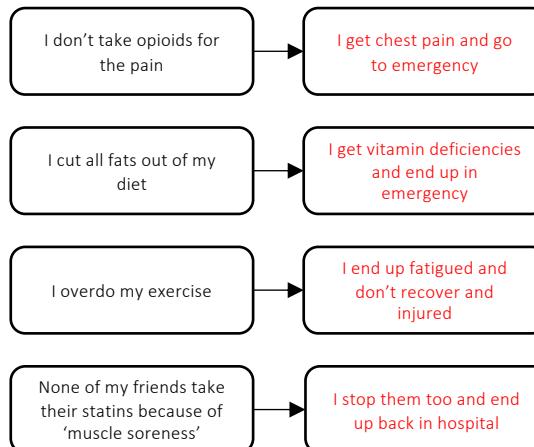
includes health ecosystems

even if you are health literate emotions can affect behaviors



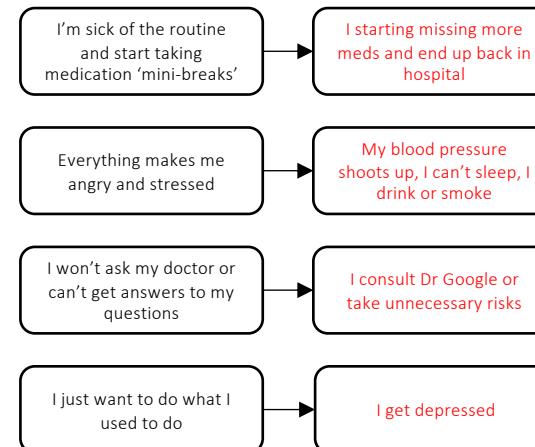
Anxious

- I want to know everything I can do
- I want to know why others are doing or taking something and I'm not
- I will overdo what I am told – over exercise, cut all fats from my diet etc.
- I won't do things that scare me like take opioids for the pain
- I want to talk to someone but don't want to worry my family or friends
- I want to know if this will happen again and when
- I want confirmation that it has worked



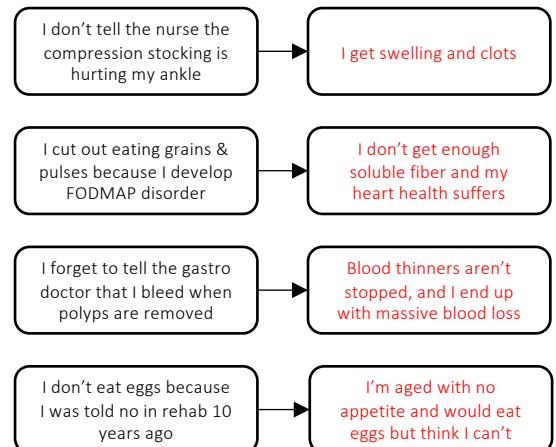
Angry

- I want to know why I have to do this or take these and others don't
- I'm sick of the routine – take these meds every morning and night, walk every day, measure everything I eat
- I just want to do what I used to do
- How do I find the answer to my questions without having to pay a doctor every time e.g. is it safe for me to ski
- Why can't anyone answer my questions e.g. my doctor doesn't know if it safe for me to ski and doesn't know who I can ask

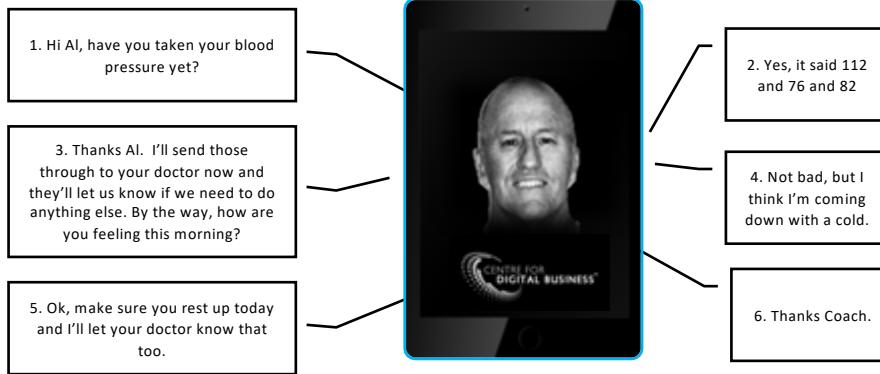


Accepting

- I have unquestioning compliance and won't express my needs or concerns especially in hospital, aged care or other managed care facility
- I won't volunteer information
- Everything is so routine I just forget to do them
- I don't bother to ask if the recommended medications and lifestyles have changed
- I have aged; my health has changed; or I've drastically changed my lifestyle (including diet and activity) but haven't checked to see if what I do for my heart should change

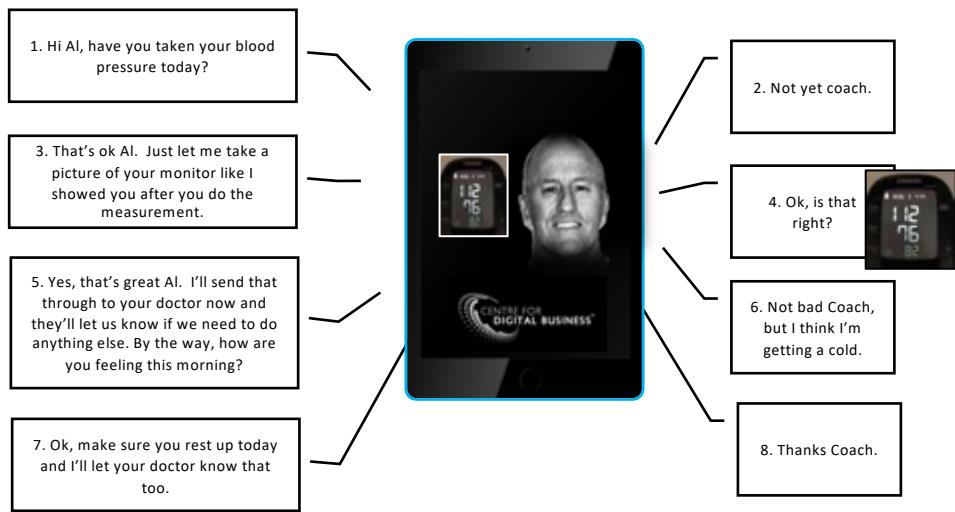


A | Using conversation to capture measurement & supplementary data



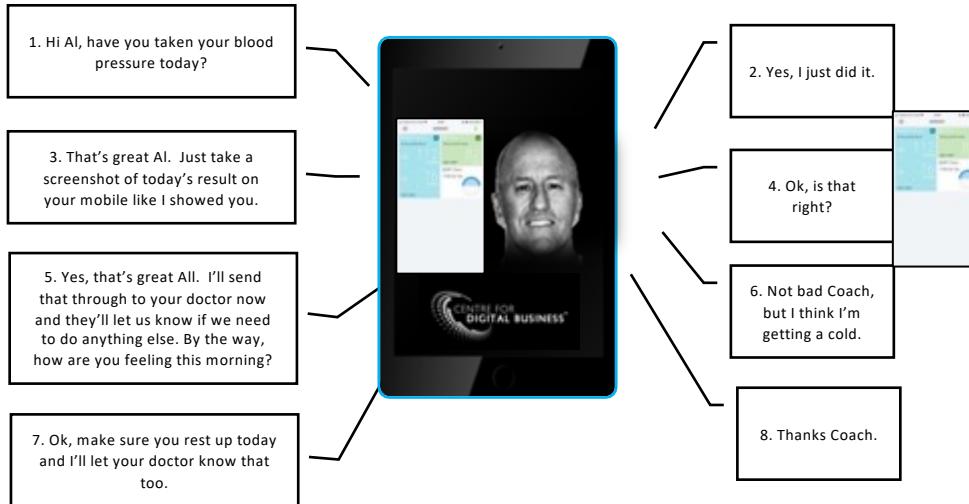
- o DHCC reminds patient to take blood pressure
- o DHCC can show patient how to use the BP monitor if they have forgotten
- o Patient simply recites the numbers in order as they appear on the BP monitor, no need to say systolic etc. or understand what they are.
- o DHCC states next steps:
 - Will send to doctor
 - They will contact us if we need to do anything more
- o DHCC checks how patient is feeling as illness, fatigue, stress etc. can affect the BP results
- o Trigger word is 'cold' for recommendation to 'rest' however codesign will likely expand this with a few more questions as some cold like symptoms can be similar to heart issues
- o Again DHCC advises importance of the role of the doctor in the procedure

B | Using machine vision to capture measurement & conversation for supplementary data



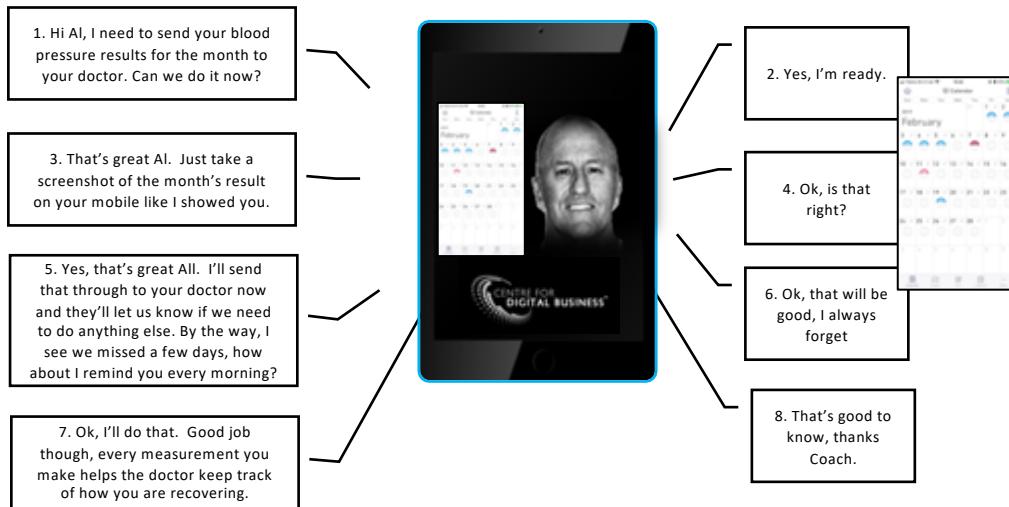
- DHCC reminds patient to take blood pressure
- DHCC can show patient how to use the BP monitor if they have forgotten
- DHCC can show patient how to use it to take a picture of the BP monitor if they have forgotten
- Patient uses the DHCC to take a picture of the display on the BP monitor, no need to say systolic etc. or understand what they are.
- DHCC states next steps:
 - Will send to doctor
 - They will contact us if we need to do anything more
- DHCC checks how patient is feeling as illness, fatigue, stress etc. can affect the BP results
- Trigger word is 'cold' for recommendation to 'rest' however codesign will likely expand this with a few more questions as some cold like symptoms can be similar to heart issues
- Again DHCC advises importance of the role of the doctor in the procedure

C | Using screen capture on BP Monitor app & conversation for supplementary data



- DHCC reminds patient to take blood pressure
- DHCC can show patient how to use the BP monitor if they have forgotten
- DHCC can show patient how to navigate to the BP monitor app and then show them how to use the DHCC to do a screen capture if they have forgotten
- Patient uses the DHCC to screen capture today's BP on the app, no need to say systolic etc. or understand what they are
- DHCC states next steps:
 - Will send to doctor
 - They will contact us if we need to do anything more
- DHCC checks how patient is feeling as illness, fatigue, stress etc. can affect the BP results
- Trigger word is 'cold' for recommendation to 'rest' however codesign will likely expand this with a few more questions as some cold like symptoms can be similar to heart issues
- Again DHCC advises importance of the role of the doctor in the procedure

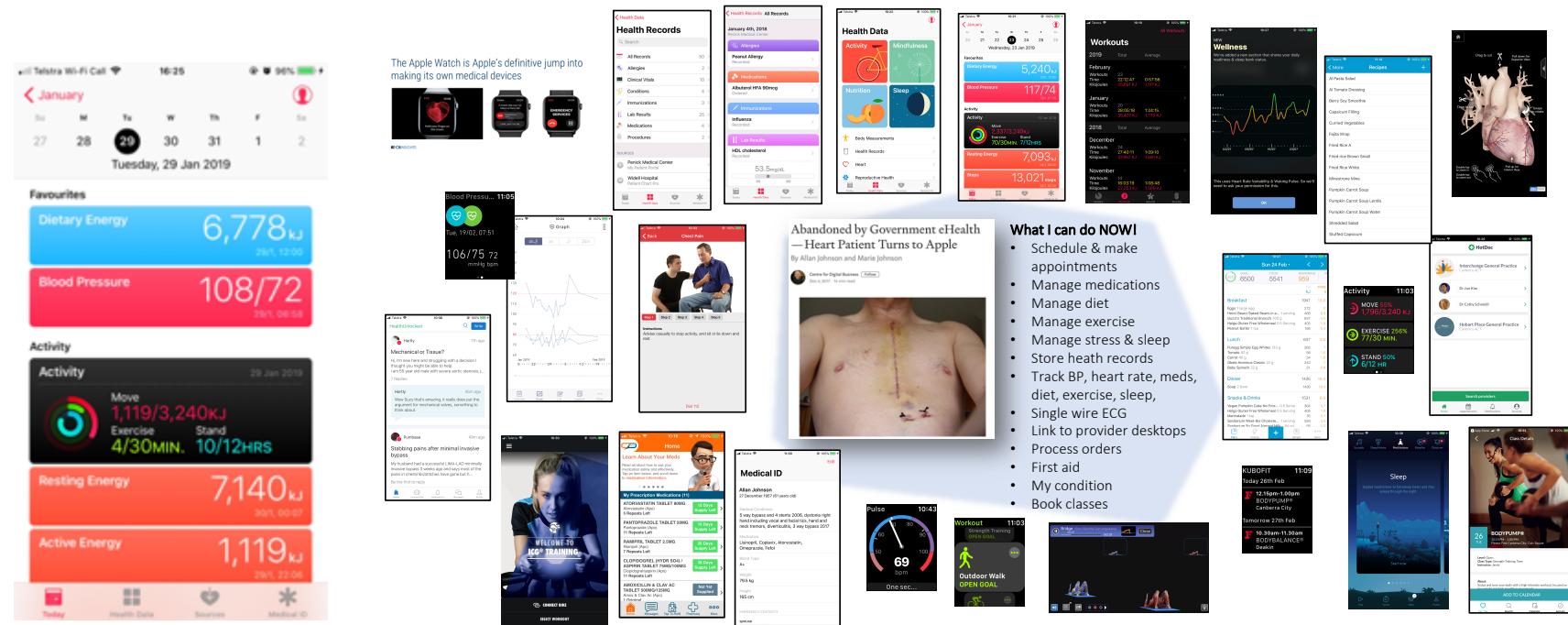
D | using screen capture on BP monitor app for monthly results & machine vision analysis to detect data gaps

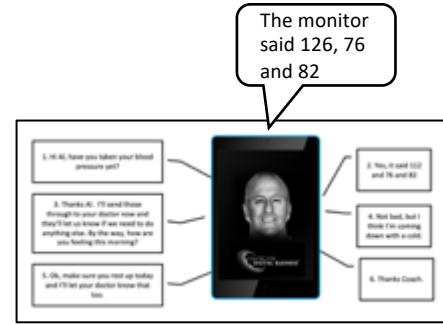


- DHCC reminds patient its time to submit monthly BP results
- DHCC can show patient how to navigate to the BP monitor app and then show them how to use the DHCC to do a screen capture if they have forgotten
- Patient uses the DHCC to screen capture this month's BP data on the app; conversation would be cumbersome to relay monthly data
- DHCC states next steps:
 - Will send to doctor
 - They will contact us if we need to do anything more
- DHCC uses machine vision analysis to detect gaps – BLUE denotes BP ok, RED denotes BP is high so white space indicates no measurement taken; note that color interpretation could later be used to identify and discuss high/low blood pressure
- DHCC recommends daily reminders to capture BP; this is critical especially in first 90 days and ongoing for certain conditions
- Again DHCC advises importance of the role of the doctor in the procedure

E | using the Apple Health ecosystem as a ‘one stop shop’ for screen capture of data such as BP, RHR, sleep etc.

- Some device apps (e.g. Omron Wireless BP Monitor) integrate with Apple Health so daily data, monthly data, trends etc. can be screen captured there along with diet, sleep, RHR etc. This would reduce the onboarding effort and complexity for patients.
- Some apps also connect with practitioner desktops. For example, Easy Diet Diary (Australia only) integrates to dietitian desktops.
- Ultimately DHCC would need to choose between integration with multiple apps or integration with just the Apple Health Ecosystem. Given the Apple Health ecosystem and app also supports HL7 ERM for health records and is rolling our ECG on Apple Watches the future direction is pretty clear.





Conversation Only

- +** • Simplest to build
- Delivers the prompts
- Easiest support for DHCC data driven decisions e.g. BP is high

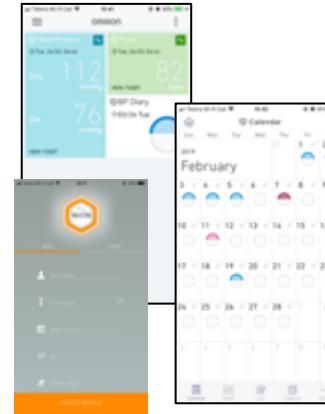
- • Patient has to be able to read and speak numbers



Conversation plus Camera

- +** • Camera concept well understood
- Large numbers easier for machine interpretation

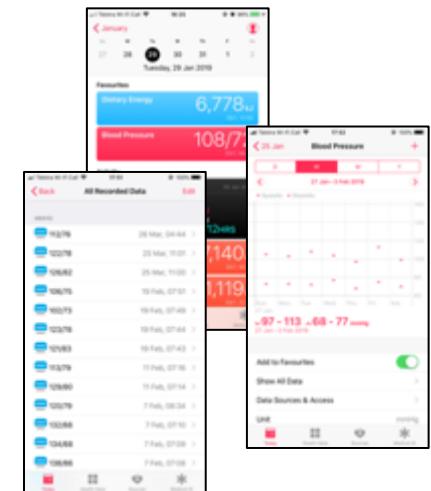
- • Requires integration to camera
- Requires machine image interpretation to enable data driven decisions
- Patients require hand/eye coordination and ability to focus
- Blurry images might not scan



Conversation plus Screen Capture Device Apps

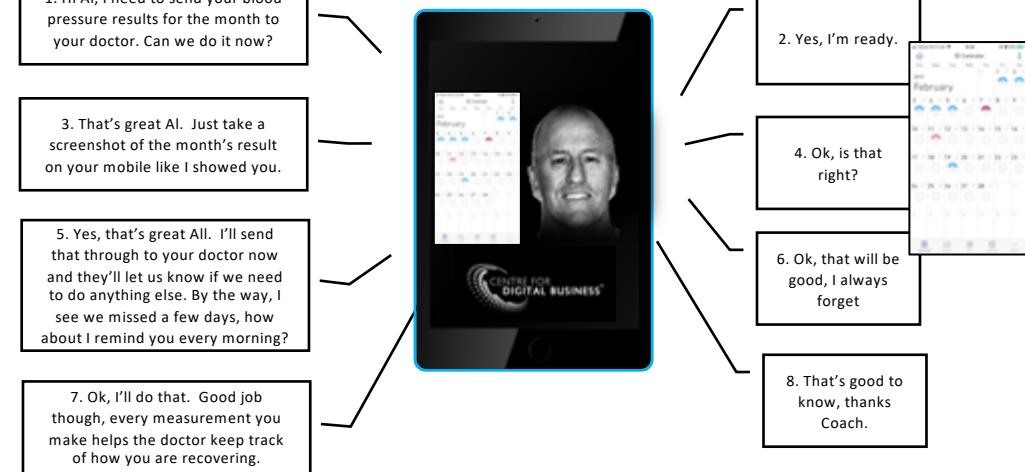
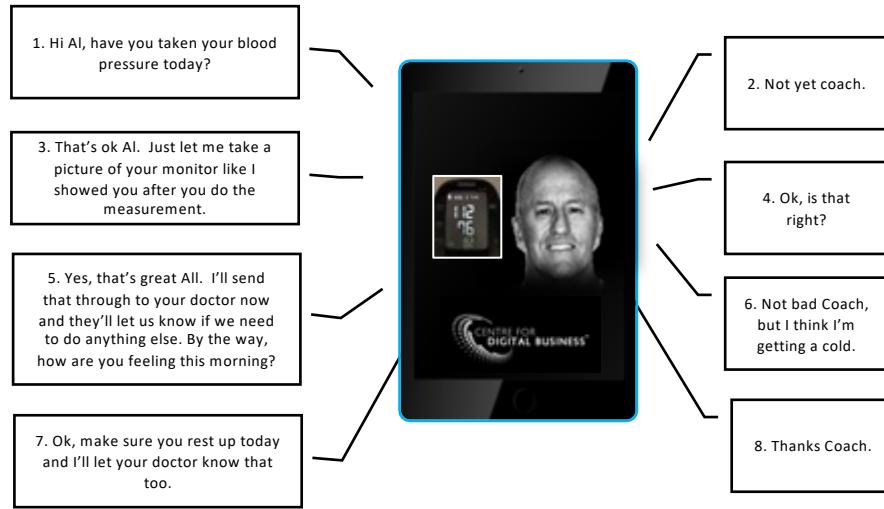
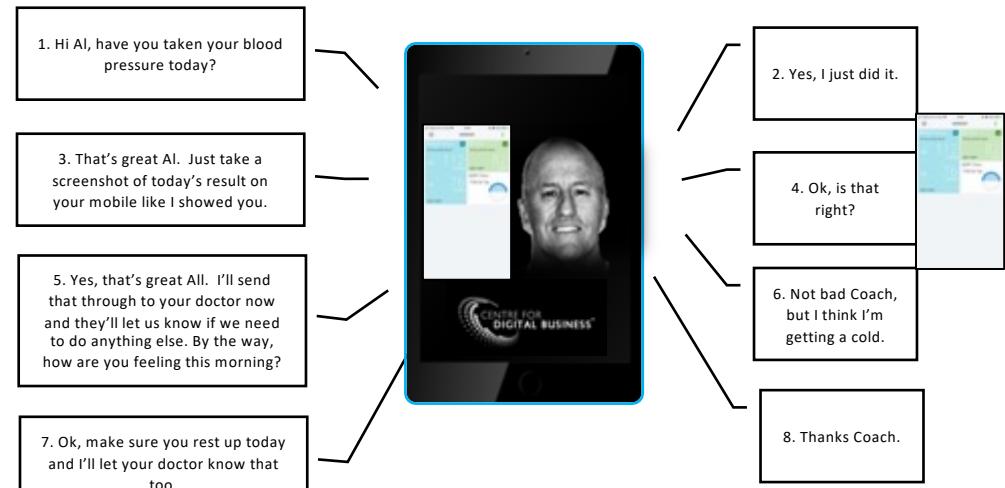
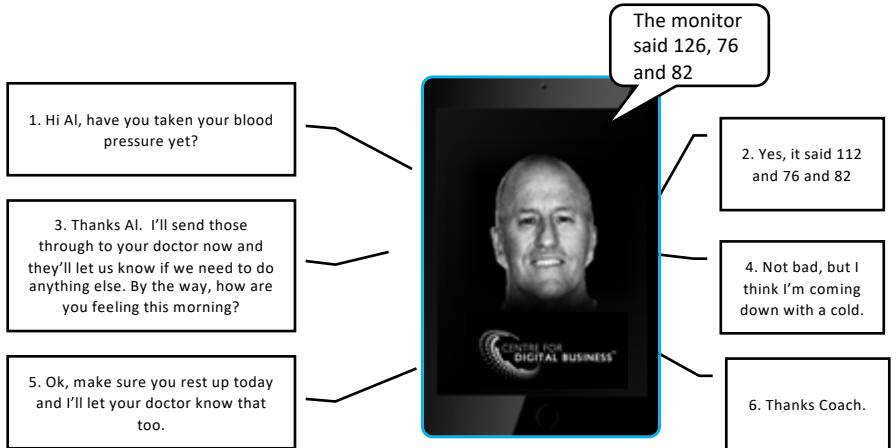
- +** • Screen capture doesn't require focusing skills
- Consistent image for scanning by DHCC per app

- • Patient has to be able to perform the screen capture buttons press or be DHCC activated
- Each app has own format e.g. BP, weight, ECG etc.
- Data often mix of text and graphics, hard to scan
- Patient has to be able to use each device app



Conversation plus Screen Capture Apple Health App

- +** • Patient only needs to learn one app
- DHCC only needs to scan one app
- Simplest pathway to integration
- Good text presentation for scanning plus value add charts
- Single device/software partner
- Patient has to be able to perform the screen capture buttons press or be DHCC activated
- Currently no integration to Tanita weight app so must screen capture that app or add via secondary app that is integrated (e.g. Easy Diet Diary) or capture by conversation (preferred)

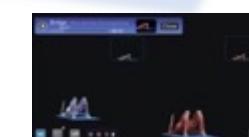
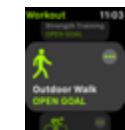
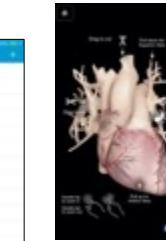
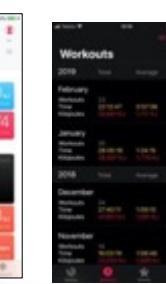
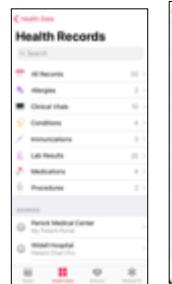
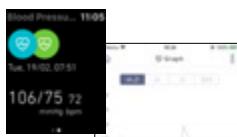


ecosystem and telehealth

health ecosystems...

knowledge of and control over my personal health in MY hands

The Apple Watch is Apple's definitive jump into making its own medical devices



Abandoned by Government eHealth — Heart Patient Turns to Apple

By Allan Johnson and Marie Johnson



What I can do NOW!

- Schedule & make appointments
- Manage medications
- Manage diet
- Manage exercise
- Manage stress & sleep
- Store health records
- Track BP, heart rate, meds, diet, exercise, sleep,
- Single wire ECG
- Link to provider desktops
- Process orders
- First aid
- My condition
- Book classes

