Digital Care Homes COVID-19 Symptom Tracker Evaluation Report

Working in collaboration with:

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Contents

1. Background to the Evaluation

Coronavirus-19 (COVID-19) was declared as a serious threat to public health by the UK government on February 10th, 2020. In response, in Greater Manchester (GM) a digital tool for falls prevention in care homes, Safe Steps, was adapted at the beginning of the pandemic, to collect resident-level data on COVID-19 symptoms and other key indicators including delirium (the COVID-19 symptoms 'tracker'). Rapid deployment of the tracker across GM localities by Health Innovation Manchester (HInM) aimed to capture an accurate picture of care home residents' health (in both nursing and residential homes), aid early identification of deterioration and facilitate efficient care planning and system response.

Aggregated data from the tracker were integrated with system information regarding care home staffing, personal protective equipment (PPE) availability etc. via Greater Manchester Tableau (the 'SitRep', situation report). Locality-level data were visible to locality hubs, GPs and GM-level health and care providers. Individual-level data were available to care home staff and localities' designated care teams. Data were intended to be conveyed in real time to enable responses to the acute and non-acute needs of residents in different homes. The information could be shared with GPs to facilitate primary care teams' planning and delivery of end-of-life care, enabling locality hubs to focus on acute clinical needs. The tracker was intended to facilitate the targeting of actions and activity to homes or residents with the greatest need.

In mid-2020, HInM asked the National Institute for Health and Care Research Applied Research Collaboration Greater Manchester (NIHR ARC-GM) to conduct an evaluation of the COVID-19 symptom tracker in GM care homes. We co-designed the evaluation objectives as follows:

- to describe the impact of the tracker on decision-making in the GM health and care system and on care processes and resident and population outcomes;
- to describe the perceptions of key stakeholders in relation to the adoption, implementation and potentially wider roll-out of the tracker.

The evaluation was pragmatic and used mixed-methods, involving separate but integrated quantitative and qualitative methods to address the research questions (see Appendix 1 for research questions and Appendix 2 for research methods). This report presents key 'actionable findings' to assist implementers in their review of deployment and to aid planning for the next phases of intervention development. This summary of actions is followed by a brief overview of key findings from the evaluation organised into three sections: 1) activity (implementation/use); 2) process (engagement) and 3) impact (effects). These sections are based on quantitative data from ten localities across GM and qualitative data from the first four localities in the region in which the tracker was consecutively deployed (see Appendix 3 for a description of the qualitative evaluation sites including brief details of existing care practices/processes in relation to care homes).

2. Actionable Findings

Box 1 presents 'actionable findings' from the COVID-19 symptom tracker evaluation, organised according to features identified in the literature as potential influences on implementation quality.[1,2] These actions highlight learning from the evaluation and may also serve as a guide for the planning/execution of future deployment efforts.

Box 1. Actionable findings from the care homes' COVID-19 symptom tracker evaluation

FEATURES	FINDINGS	SUMMARY OF ACTIONS (ACROSS FINDINGS)
Intervention	Data input to tool technically straightforward for care homes, however, purpose/advantages unclear and some data fields challenging to interpret influencing decline in engagement over time (all localities). Some duplication with other tools. Little evidence of impact on reducing COVID-19 spread (all localities).	***1. Intervention development/testing*** Co-creation with intended users in early stages to ensure problem formulation/logic behind intervention fits user-identified needs; small-scale development/testing of intervention question fields to better target problem to be addressed; use feedback and reflection to adapt intervention to prioritise user needs in changing circumstances. ***2. Stakeholder engagement*** Involve intended users of intervention at an early stage (e.g. harness commitment of relevant leaders, managers, and operational staff and include individuals with accountability for relevant aspects of care). Ensure all stakeholders have clear understanding of what the intervention is and how use will support care processes (e.g. early identification of deterioration and efficient care planning). ***3. Compatibility with existing infrastructure and work processes*** Consider how good a fit the clinical/digital infrastructure in each locality is in relation to intervention implementation; small-scale testing of intervention in localities to assess effects on workload. ***4. User training and support*** The care home sector may require extra support to enable change given the wider challenges it faces; target training consistently at increasing users' understanding of intervention's purpose, content, expected benefits and 'ask' and knowledge/skills/confidence to interpret and document symptoms; ensure adequate follow-up support over time for all staff levels; adapt training on basis of feedback/reflection if needed; establish roles and responsibilities for post-training support in localities.
Outer setting	Unprecedented workload pressures due to pandemic across already pressurised health and care system. Multiple, rapid and simultaneous interventions targeted at reducing COVID-19 spread (e.g. testing and vaccinations) led to tool-generated symptom data losing value as early warning system. Where clinical support for care homes (infrastructure) more streamlined, engagement with tool was greater (two localities). Where digital infrastructure more mature, engagement also greater (one locality).	
Inner setting	Existing workforce shortages in care home sector compounded by pandemic hampered engagement (e.g. COVID-19 outbreaks; need for staff isolation; testing/vaccination). Some workload increases associated with tool use.	
Individuals required to use/engage with intervention	Data input guarded by care home managers in most homes leading to data gaps and preventing use by wider workforce. No impact on residents' management but some improved contact with clinicians (one locality) – associated with greater engagement. Home staff amenable to use of adapted tool 'beyond' COVID-19. Tool-generated data informed clinical decision-making in one locality only, where clinical buy-in was particularly strong; clinical concerns in other localities about data quality, associated with lower engagement.	
Implementation process	Less robust engagement of clinician stakeholders associated with lower tool engagement (two localities). Intensity of care home training and 'ask' varied across time and locality, affecting understanding and engagement (i.e. rate of decline less marked and views of tool more positive in localities receiving in-depth training).	

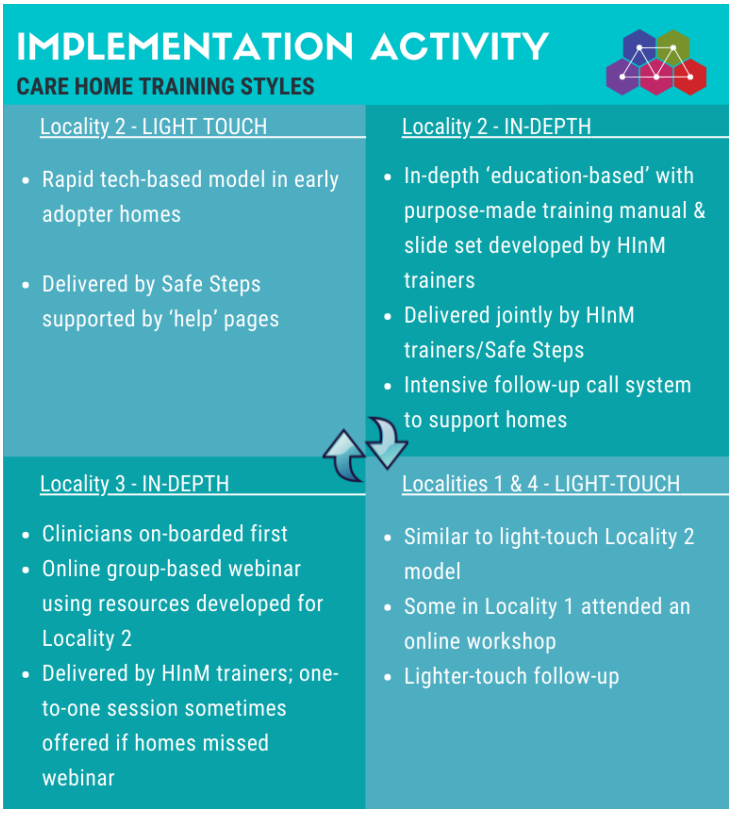
3. Overview of Key Findings

3.1 Activity

3.1.1 Implementation activity

Training care homes to use the tracker

The style of training delivered to care homes varied over time, flexing between a 'lighter-touch,' technical, 'on-boarding' model and a more intensive 'in-depth,' education-focused model with additional resources/follow-up. Training style sometimes varied within a single locality (see graphic left). It was suggested that these changes arose from a perceived need among implementers to balance two concerns; speed of deployment and training depth:



> *"One of our ambitions [for the in-depth training] was to help with the data quality issue and make sure that… [care homes] were understanding why they were being asked questions… we've got to get that balance between… how do we get people on it properly, but how do we get people on it quickly?... at the moment I think the concerns around speed are winning over the concerns of data quality." (Implementation Lead 5)*

Roles/responsibilities for ongoing support to homes were not defined leading to a lack of ownership of the tracker in localities:

> *"There's been a slight disconnect in thinking that we [implementers] are doing all this for them [localities], but actually, no – it's **yours**." (Implementation Lead 6)*

What care homes were 'asked' to do

Over time there was also variation in the reported 'ask' of homes in relation to the number, type and timing of resident assessments expected to be input to the tracker:

- once or twice per week-vs-daily
- COVID-19 symptoms-vs-wider wellbeing

- undefined timing-vs-before 11am

This created some lack of clarity in homes' understanding of the purpose of the tracker.

3.1.2 Uptake of the tracker in care homes

Figure 1 gives a brief deployment timeline of the tracker for the period April 2020 to April 2021. The tracker was first deployed in Tameside and Glossop at the start of April 2020; by mid-June 2021 the tracker had been deployed to one hundred and sixty care homes.

The proportion of homes using the tracker varied across localities; by mid-June 2021 this ranged from 3% to 95% across eight localities, with a further two localities having not deployed the tracker.

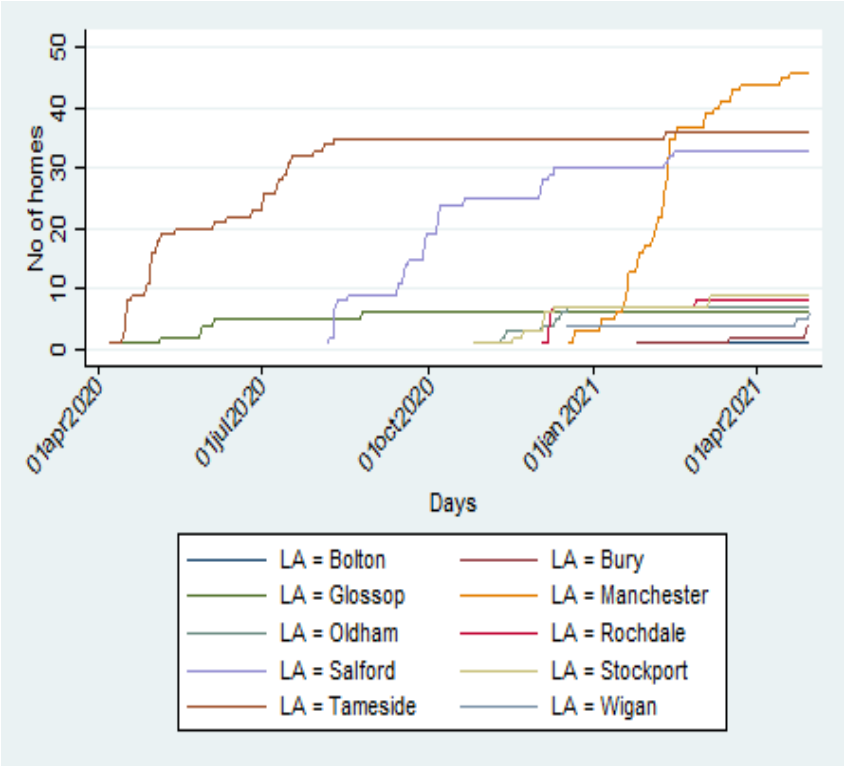


Figure 1. Deployment of the tracker over time, by locality

We compared the characteristics of care homes using the tracker with care homes not using the tracker to see how representative these homes were of the GM care home population. Care homes using the tracker (Apr 2020 to Apr 2021) were more likely to be:

- Not-for-profit care homes (compared with for-profit homes).
- Residential care homes (compared with nursing homes or homes with both nursing and residential services).
- Homes rated as outstanding by the Care Quality Commission (CQC) (compared with those rated good or requires improvement).
- Relatively more medium-sized [24-40 residents] homes (compared with small [1-23 residents] and large-sized [41+ residents] homes).

Homes with residents with dementia are overrepresented, and homes with residents with learning disability and/or autism, and those homing people with mental health problems, were under-represented on the tracker (compared with homes without residents with these conditions).

We took account of these differences when we evaluated the impact of the tracker (so that we could be more confident that we were attributing impact to the tracker and not these differences).

3.2 Process

3.2.1 Understanding of tracker purpose and 'ask'

Perceived purpose

Care home staff exhibited a range of views about the purpose of the tracker, e.g. that it was for:

- Providing data to ensure a quicker clinical response for residents (although care homes beyond Locality 2 said this rapid clinical response was not always received);
- Collecting statistics to benefit other organisations regionally or nationally and not necessarily to help homes; this view applied across localities:

"I was trying to sort of work out who it was helping – the Clinical Commissioning Group (CCG), so they can keep an eye on what's going on in the care homes, without having to actually contact us? I don't know." (Care Home Manager 2, Locality 2)

Clinical and locality leads also expressed a range of views. They:

- Generally doubted whether homes understood the purpose of the tracker;
- Expressed concern that a lack of understanding about the purpose affected accuracy of completion and compliance;
- Saw a need for adequate training/education to address this:

"Care homes need to see that there's a need for them to do it. So some homes were saying, you know, 'who's even looking at it, who even cares?'...if we're asking them to do this, then they need to see that actually there's a reason for you doing this because it helps a system-wide process. I'm not sure in terms of the education and training for the care homes, they understand quite how important it is really for them to use it." (Allied Health Professional 2, Locality 3)

Perceived 'ask'

Care home staff mostly understood that the 'ask' was daily data input including at weekends. However, they reported that data input was mainly made by care home managers on weekdays, with input dropping at weekends (when managers tended not to work) due to the availability of staff responsible for completion and other work pressures.

3.2.2 Perceptions and experiences of using the tracker

Overall care home staff reported that the tracker was technically straightforward and quick to use, but there were mixed views on the level of burden involved. Some stated that it only took a few minutes a day:

> *"…it's no bother whatsoever, it doesn't take any nursing minutes away." (Care Home Manager 8, Locality 3)*

Others reported that the burden of daily completion was too great, particularly those in larger care homes with many residents. Some reported that during extremely busy periods, and, in particular, during COVID-19 outbreaks, inputting into the tracker became low priority:

> *" …even though it might only be a five minute job…it was just five minutes I didn't have at the time." (Care Home Manager 13, Locality 3)*

Overall, more positive views on the tracker were found in Localities 2 and 3 and less positive in Localities 1 and 4. Positive views were often associated with viewing the tracker as useful for documenting/recording information (such as end-of-life data) all in one place, providing an audit trail. A few homes found the tracker of value in monitoring residents' health status more closely:

> *"…it just alerts you to things. You look at it and think, 'oh yeah, perhaps there is a change in that person', and it makes you do a double check."*
> *(Care Home Manager 3, Locality 2)*

Some care home staff, however, expressed indifference towards the tracker and described it as 'another tick-box exercise'. There was also some confusion over which tracker was which, due to the number of other tools/trackers care home staff were being asked to complete. As such, there was some reported duplication with other data reporting systems and concern that some tracker questions such as those on COVID-19 symptoms were not sufficiently sensitive/specific:

> *"It says, 'have they got a temperature or a cough?'… and as we know… COVID-19… can be completely different in care settings… with this elderly population… it's not sensitive enough… [residents] can develop a temperature just with a bit of dehydration or whatever… everybody's sort of panicking and on high alert, you know? I don't know if it needs to be a bit more specific that part… describing the symptoms?" (Care Home Manager 2, Locality 2)*

3.2.3 Perceptions/experiences of using tracker-generated data

Clinicians

Clinicians' perceptions/experiences were mixed, with those from Locality 2 expressing more positive views about the type of data collected and its clinical usefulness than those from other localities. Locality 2 clinicians saw a clear advantage in using the tracker and therefore prioritised its use:

> *"…we were asked by our CCG to do proactive advanced care planning for all our high risk patients in the care homes. So the tracker actually helped us to identify the cohort of the people." (GP 2, Locality 2)*

Clinicians in other localities were less positive, reporting that the data collected via the tracker were not necessarily new to them and could be clinically limited. Using the tracker was not a priority for them:

> *"[There's] not [much] information that I will say, well, I need to know that from the app…. I probably would look into having more meaty clinical things in it for me to appreciate it more." (GP 4, Locality 3)*

Data quality was also considered an issue, due to both to variability in completion rates and a perception that inputted data could be inaccurate; this was reported as a barrier to using tracker-generated data. Some felt however that the tracker could show residents' DNAR (Do not attempt resuscitation)/ACP (Anticipatory Care Planning) status and that this was valuable.

Care home staff

Most staff did not see how they would use the data generated by the tracker, viewing it as a reporting tool rather than a planning tool to help care homes. One home in Locality 4 however, reported using tracker data to support their MDTs (Multi-disciplinary Care Home Support Team)

Locality leads

Leads described the tracker as rather a 'blunt' tool for generating meaningful COVID-19 symptom data, but a pragmatic starting point in the face of a crisis. However, the overall importance and value of the data provided by the tracker to the wider system was questioned:

> *"Even given… [the] COVID-19 crisis situation... when you think about [it], has it really left the systems thinking, 'oh my God, I can't do without it!' the answer is – no, it hasn't left us thinking that." (Locality Lead 8, Locality 4)*

General view

There was a sense across participant groups that the COVID-19 symptom data generated by the tracker lost its value as an early warning system due to the increase in COVID-19 testing over time, which could enable outbreaks to be identified before symptoms showed.

3.2.4 Care home engagement with tracker

Engagement with the tracker was measured as the percentage of the residents assessed [(residents assessed/total residents) x100]. There was a significant variation in assessments over time, across days of the week, by locality, and by type of care home. On average, care homes conducted three assessments per week, meaning there was no assessment for four days of a typical week in a typical care home. When assessments were conducted, they mostly assessed all residents.

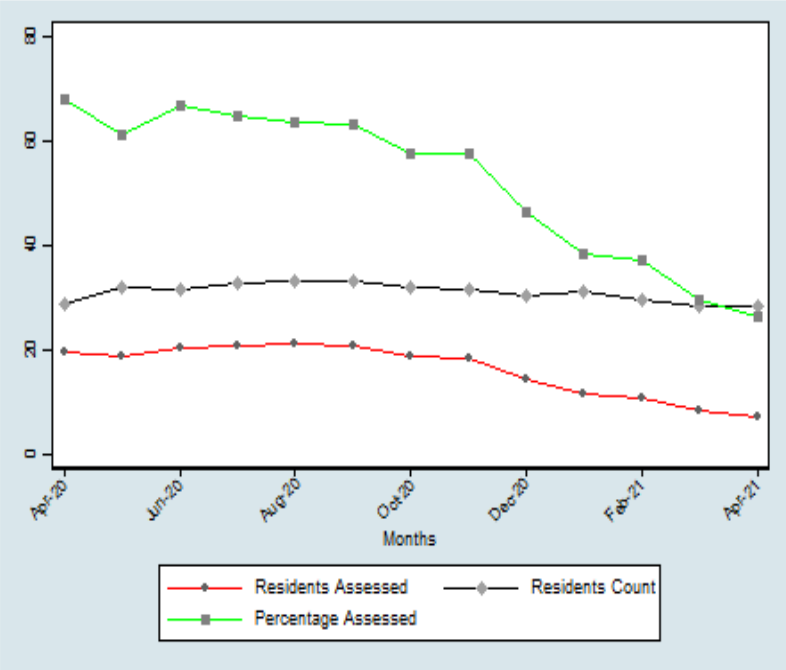


Figure 2. Monthly assessments

Figure 2 plots average monthly assessment rates for all care homes using the tracker from April 2020 to April 2021. The average assessment rate was approximately 44% (a rate of 100% would mean every resident was assessed every day of the month). The assessment rate was approximately 58% during April-December 2020 and 32% in January-April 2021.

The decreasing trends in assessments were found in care homes in all localities, albeit at different rates.

Assessment rates were greater during weekdays (50% to 54%), whereas on weekends the average assessment was 24%. Qualitative data identified that assessments were made mainly by care home managers, who tended not to work at weekends, which may partially explain this weekend drop (see Section 3.2.1). In terms of localities, assessment rates varied between 57% and 13%.

Assessment rates varied by types of homes:

- 47% in independent care homes versus 40% in care homes related to brands/chains.
- 45% in for-profit care homes versus 27% in not-for-profit care homes.
- 46% in homes with no dementia residents versus 40% in homes with dementia residents.

- 47% in homes with no learning disability/autism residents versus 15% in homes with learning disability/autism residents.
- 39%, 48%, and 45% in small [1-23 residents], medium [24-40 residents], and large care homes [41+ residents], respectively.

3.2.5 Changes in engagement over time

The tracker was deployed during the COVID-19 pandemic, with many potential factors impacting on assessment rates (e.g. vaccinations, changes in the number of homes on tracker over time, COVID-19 cases, residents' health status, workload pressures, etc.). Understanding the factors associated with assessments over time may provide context for the decline in assessment rates in *Figure 2*.

Assessment rates over time:

- Assessment rates increased with the introduction of homes onto the tracker. The decline in assessment rates over time (*Figure 2*) does not appear to be caused by newer homes coming on the tracker in later stages.
- Assessment rates increased with increases in the percentage of residents in a care home identified as being confused.
- No association was found between assessment rates and: volume of staff; staff self-isolating; volume of occupied beds; PPE stock or proportion of residents being critically ill (RAG status red).
- No association was found between assessment rates and proportion of residents with COVID-19 symptoms or COVID-19 cases in the care home local area.

The positive association between confusion and assessment and the lack of association between the number of residents with COVID-19 and assessment suggest that homes may have been alerted to the initial signs of a COVID-19 outbreak but once the outbreak was in place, homes reduced assessments. This may be due to staff being more busy or alternative precautionary measures in place.

The assessment rate was decreasing over time even after adjusting for a host of factors. This might reflect changes in perceptions of the value of the tracker when pandemic pressures eased. Other possible reasons for the decline are found in the qualitative findings concerning barriers and facilitators to implementation and use (Section 3.2.7).

3.2.6 Changes in Advanced Care Plan recording over time

Care homes were encouraged to have Advanced Care Plans (ACPs) in place for residents during the pandemic.[3] We explored the factors that were associated with a greater proportion of residents with ACPs.

Advanced Care Plans over time:

- The recording of ACPs increased with an increase in i) volume of staff, ii) COVID-19 cases in the care home local area, iii) proportion of residents being critically ill.

- The recording of ACPs decreased with an increase in i) occupancy level, ii) number of staff self-isolating, iii) proportion of care home residents with COVID-19 symptoms.

It is important to note that some of the results above differ if the analysis is conducted for the full sample (i.e., April 2020 to April 2021 to include the period after vaccinations initiated) but we feel this is more likely to be less reliable.

3.2.7 Barriers and facilitators to implementation and use of tracker

A number of factors appeared to act as barriers to, or facilitators of, engagement with the tracker. These factors may partially explain the variation in rates of assessment reported in Section 3.2.4.

Clinical infrastructure

- Where homes in a locality were linked with a single clinical team, there was greater engagement (i.e., more assessments made). This applied to Localities 2 and 3 where assessment rates were higher.

Clinical 'buy-in'

- Where clinicians' 'buy-in' was perceived to be poor, the engagement of homes with the tracker was also poorer. This applied particularly in Localities 1 and 4 where assessment rates were lower. A bi-directional effect was indicated here, such that when clinicians had more positive views of the tracker, homes' engagement was greater (Locality 2), and vice versa (Localities 1 and 4).

Depth of training

- More positive views about the tracker and stronger engagement was found among homes that received the in-depth training (largely homes in Localities 2 and 3) as opposed to the lighter-touch training (largely homes in Localities 1 and 4). See Section 3.2.4 for variation in assessment rates and Section 3.1.1 for a brief description of training styles across localities.

Realisation of tangible benefits

- Where care homes perceived greater tangible benefits associated with using the tracker, e.g., where the tracker was felt to enable communication between homes

and clinicians or prioritisation of high-risk patients by clinicians, homes' engagement with the tracker was greater (largely Locality 2).

Workload and capacity

- Whilst perceived ease of use of the tracker facilitated engagement, data input was perceived as more time-consuming in some larger homes.
- Additional externally-generated work pressures on care homes/clinicians in the pandemic hampered implementation and use (across localities) e.g., managing COVID-19 outbreaks, workforce shortages resulting from staff isolation and the COVID-19 testing and vaccinations programmes. These findings resonate with interpretations of quantitative data presented in Section 3.2.5, suggesting that at the onset of COVID-19 outbreaks, homes may have reduced their assessments.

Digital infrastructure

- The maturity of a locality's remote-monitoring capability appeared to facilitate or hinder implementation and use, including the availability of IT equipment, digital literacy of the care homes and the inter-operability of the tracker with existing systems. Remote monitoring was routine practice in Locality 2, where assessment rates were higher, and less developed in other localities.

3.3 Impact

3.3.1 Perceived impact on care decisions and practices, workload and workflow

Care home staff

In general, care home staff reported that using the tracker had not changed the ways in which they managed residents' care. However, some considered the RAG rating system to be useful for monitoring non-COVID-19 related conditions:

> *"[It's] not [helped] with COVID but I think it's helped us with other infections, sort of urine infections, chest infections…that's where I tend to find it's quite useful."*
> *(Care Home Manager 1, Locality 1)*

Other non-COVID-19-related benefits were perceived, such as aiding closer observation of residents' health, storing information in one place and identifying missing ACPs. Workload increases as a result of tracker use were said to be minimal for many homes, but some larger homes reported a noticeable increase.

Views and experiences about whether using the tracker improved contact with clinicians varied between and within areas. Care home staff in Locality 2 were more likely to report that using the tracker elicited a response from a clinician (and specifically from the locality hub). In Localities 1 and 4 however, staff reported no change in communication and some questioned whether any clinicians in the locality were looking at the data:

"There's no actual indicator that the data has been reviewed or seen by anybody... it's almost like the one-way flow type situation." (Care Home Manager 18, Locality 4)

Clinicians

Clinicians in Locality 2 were the most positive about the tracker's impact on care decisions, for both acute and proactive management. In Locality 3, the tracker was felt useful for identifying high-risk patients, but was not felt to be informing care decisions there or in Localities 1 and 4 either.

In Locality 2, the tracker was said to be a 'good fit' with existing care practices/processes (e.g., the locality hub's protocols) and was supplementing rather than replacing these. Some GPs in this locality reported a decrease in workload (the tracker had enabled the prioritisation of high-risk patients, which resulted in more focused communication), but an increase for the locality hub was reported. In Localities 3 and 4 some workload increases were reported, due to duplication of effort and/or needing to follow-up perceived data inaccuracies.

3.3.2 Tracker impact on COVID-19 symptoms/cases and PPE stock

Data regarding COVID-19 symptoms/cases were sourced from the Situational Report (SitRep) data in the GM Tableau.[i] Comparisons of COVID-19 symptoms/cases in care homes pre- and post-adoption of the tracker with homes not engaged with the tracker were made.[ii] Additional analyses assessed PPE stock. We do stress however that the impact analyses are beset by data problems such as missing data on a range of potentially confounding factors such as vaccinations and testing policies in care homes. These limitations mean the results should be interpreted with caution.

Measurement of COVID-19 symptoms/cases:
A key concern with the analysis is whether COVID-19 symptoms/cases reported in the SitRep are a good measure of COVID-19 in care homes. The SitRep data includes daily numbers of care home residents with confirmed or suspected COVID-19. However without testing, temperature/dry cough due to other reasons might be attributed to COVID-19. Similarly, COVID-19 positive but untested and asymptomatic residents might be wrongly classified as COVID-19 negative. This may mean the analysis on COVID-19 symptoms/cases is flawed. Given this, the analyses assessed whether the COVID-19 symptoms/cases data in the SitRep were associated with the COVID-19 deaths in care homes at locality level. The association is plotted in *Figure 3*.

[i] Appendix 1 provides further details of this data source
[ii] Analyses were conducted for the period April to December 2020 due to the potential impact of vaccinations in confounding the relationship between the tracker and the impact measures

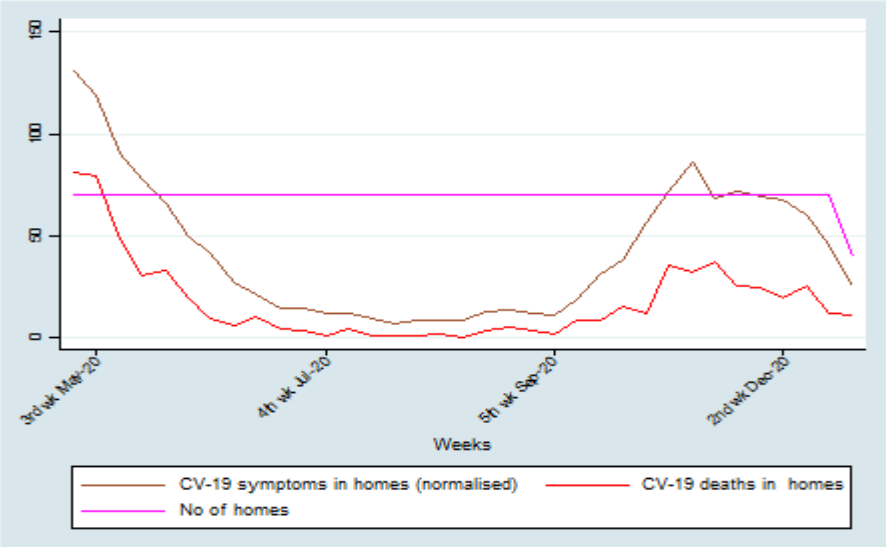


Figure 3. Care homes symptoms/cases and COVID-19 deaths in homes

A close association was found between reported COVID-19 symptoms/cases in care homes and COVID-19-related deaths in care homes. The association was also confirmed in the statistical analysis of COVID-19 deaths on COVID-19 symptoms in care homes. This provides some indication that the COVID-19 symptoms/cases data captured in the SitRep may be a good approximation for COVID-19 in a care home.

The impact of the tracker on COVID-19 symptoms/cases:

- No statistically significant association was found between tracker use and COVID-19 symptoms/cases in care homes. This resonates with qualitative findings in Section 3.2.3 suggesting that tracker-generated COVID-19 symptom data were perceived to be of limited value as an early warning system.
- COVID-19 symptoms/cases were greater in care homes with higher volumes of staff self-isolating.
- COVID-19 symptoms/cases were greater in care homes with greater COVID-19 cases in the home local area.

The impact of the tracker on PPE stock:

- Tracker use was found to be associated with having an adequate supply of PPE.

3.3.4 Future adoption of other digital approaches

Care home staff and locality leads

Care home staff and locality leads' experiences of using the COVID-19 tracker did not appear to influence their willingness to consider adopting other digital tools in the future. Care home managers were found to be generally amenable to working more digitally and expressed interest in an 'adapted' tracker for use beyond COVID-19:

> *"[Tracker is] very COVID-19 related. It doesn't highlight whether people have deteriorated from any other condition. So, if it's to continue I think we need to add deterioration in other health conditions, you know, like… if someone's got chest pains and he's got a UTI, somebody's got a chest infection, [tracker] doesn't*

necessarily highlight it because… it's aimed mainly at COVID-19."
(Care Home Manager 3, Locality 2)

The tracker was often seen as a stepping stone to further digital support for care homes and there was a strong interest in adding functionality (e.g. falls app; Restore 2 Mini) was expressed:

"The feedback I had from a couple of homes was [COVID-19 tracker] is fine and it's easy to update, but I'm really interested in the Restore 2 Mini or the falls prevention [app] because that will have a new benefit to them that they haven't got in-house already. And I think where we've sold it is that it is using the [tracker], which they've maybe heard of [previously] in terms of falls prevention, and I think the people that have come on it have probably come on it with a longer-term vision around Restore 2 Mini and the falls too." (Locality Lead 7, Locality 4)

Clinicians

Clinicians also expressed an interest in additional functionality for the tracker; particularly the falls app and/or frailty tool. However, they expressed some reservations about the readiness of homes to take on further digital approaches:

"So we're then still having to… hand deliver things to them… not all the care homes have computers, so… care plans and things like that are all handwritten... so we've come a long way in the fact that we've got Wi-Fi and they've got access but not enough really to benefit them just yet I don't think."
(Allied Health Professional 2, Locality 3)

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4. Conclusions

A summary of findings and key actions from the evaluation (focusing on: intervention testing and development; stakeholder engagement; compatibility with existing infrastructure and work processes and; user training and support), can be found in Section 2 (Box 1). These actions highlight learning from the evaluation and may also assist implementers in their review of deployment and aid planning for the next phases of intervention development.

5. References

[1] Damschroder LJ, Aron DC, Keith RE, Kirsh SR, Alexander JA, Lowery JC. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. *Implement Sci. 2009;4:50.*

[2] Keith RE, Crosson JC, O'Malley AS, Cromp D and Taylor EF. Using the Consolidated Framework for Implementation Research (CFIR) to produce actionable findings: a rapid-cycle evaluation approach to improving implementation. *Implement Sci. 2017;12:15.*

[3] BMA, CPA, CQC, RCGP. Joint statement on advance care planning. 01.04.20. https://www.rcgp.org.uk/about-us/news/2020/april/joint-statement-on-advance-care-planning.aspx (Last accessed 28.09.21).

Appendix 1: Research Questions

Summary of evaluation questions

Process evaluation

- What activity did implementation and use of the COVID-19 symptom tracker involve? How was this decided?
- How did care home staff understand the purpose of the tracker and what was being asked of them?
- What were care home staff's general perceptions and experiences of using the tracker and the data it provided?
- What were the barriers and facilitators to implementation and use of the tracker and its data? How these were different in different contexts (e.g., types of home, locality)?
- What were staff perceptions of using the tracker specifically to inform care decisions and impact on spread of COVID-19?
- Did use of the tracker impact on decision making, care practices, workload and workflow?

Impact evaluation

- What are the impacts of the initiative on costs to the health and care system and health of care home residents? (association with spread of COVID-19, falls, hospital admissions)

System planning

- Did the addition of the tracker impact on GM system wide decisions about resource allocation etc.?
- What are the perceptions of key decision-makers regarding the nature and quality of the data provided to them to support their decision-making (primary care providers, locality level, GM system)?
- Is the tracker a good way of collecting the COVID-19 (and other) data? How do the processes and impacts compare with the previous spreadsheet/phone call approaches?
- Are there certain types of care homes that appear to have relatively greater COVID-19 incidence?
- What does the COVID-19 dashboard tell us about how COVID-19 spreads in care homes and are there certain types of care homes that appear to have different spread?
- Are care homes that successfully adopted the tracker more likely to adopt other digital approaches in the future?

Appendix 2: Evaluation Methods and Data Sources

Summary of quantitative methods

Data

The quantitative analyses used data from a range of sources. Data on the tracker were sourced from Greater Manchester Tableau, these were linked to data from the Business Intelligence Situation Report (BI SitRep[i]) from all GM localities on a care home's staffing levels, staff-self-isolating, occupancy levels, residents with symptoms and/or tested positive, issues in accepting new placements and Personal Protective Equipment (PPE) availability (masks, aprons, gloves, hand sanitizers, eye protectors). Further linkages were made between the Tableau data and Care Quality Commission (CQC) records on care homes' different characteristics including their overall ratings. Middle Super Output Area (MSOA) level weekly COVID-19 confirmed cases data were merged to account for the COVID-19 situation in the vicinity of the care home. Data on the Index of Multiple Deprivation (IMD) ranking of each Lower Super Output Area (LSOA) were also merged to the care homes database in order to enable the analysis to control for the deprivation level of the area where the care home is located.

The evaluation team could not get access to vaccination data for the care homes to control for the potential impact of vaccinations on both engagement and COVID-19 spread in 2021. Similarly, data on care home admissions to hospitals and alternative data on COVID-19 confirmed cases (versus symptoms) could not be accessed. These have constrained the quantitative analyses from precise impact evaluation of the tracker.

Sample period

The full sample covered April 2020 to April 2021 period and consisted of 563 care homes from ten GM localities, out of which 141 homes were on the tracker by end April 2021, excluding six homes from Glossop as Glossop's homes are not included in SitRep. To avoid the possible vaccination effects, the analyses were performed on a pre-vaccination sample covering April to December 2020, with 92 homes on tracker out of 551 in the sample.

[i] Starting from 20th April 2020, the ten local authorities across GM submit each care home data on the available and occupied beds, staff head count, staff available for work, staff self-isolating, residents with symptoms/tested positive, PPE stock and last reported PPE issues, problems in accepting new placements, problems in accessing medicine prescription, comments on workers issues, etc. In 2020, 90% care homes in GM were submitting daily data on the mentioned variable, whereas it has dropped to 78% in 2021.

Evaluation methods

The engagement analysis in Section 3.2.5 regressed the proportion of assessed residents, respectively proportion of residents with ACPs in Section 3.2.6, on calendar time, daily number of homes on the tracker, proportion of residents with COVID-19 symptoms, confused and critically sick (RAG status red), the number of care home workers available for work, staff self-isolating, occupied beds, PPE stock and local level COVID-19 confirmed cases, along with care home, local authority, weeks and monthly dummies to control for locality specific characteristics and common time shocks. The analyses were carried both with linear and non-linear regression models for only those homes using the tracker during the evaluation period.

The impact evaluation analysis in Section 3.3.2 compared the changes in COVID-19 symptoms/cases and PPE stock in the homes on the tracker (treated group) with the changes in the respective variables in homes that were not using the tracker (control group) in the pre-tracker and post-tracker use periods (before-after analysis of changes in outcomes between the treated and control groups). To make the two groups as similar as possible, statistical techniques (Propensity score and Mahanalobis distance based matching) were employed to match the treated and control groups on different characteristics, this helps to make like for like comparisons between care homes using and not using the tracker. Since the tracker is activated gradually in different localities and homes, the analysis used event design before-after analysis to account for variations in the uptake timings. Given that the number of residents with COVID-19 symptoms is a count variable, probability-based regression models were used for the before-after analysis. Further robustness checks were carried with non-parametric estimation methods.

Summary of qualitative methods

Ethics

Ethical permission to conduct the research obtained from the University of Manchester Research Ethics Committee (UREC) Ref: 2020-10067-16025 and Ref: 2020-9401-15954.

Sampling and recruitment

Purposive, snowball and theoretical sampling in four groups – care home staff, locality leads, clinicians and HInM implementation leads – to ensure a wide range of perspectives on implementation of the tracker. Recruitment through the Portfolio Management Office (PMO) team at HInM.

Data collection

Data collection mainly via in-depth semi-structured interviews (conducted remotely and audio-recorded with consent by telephone or Microsoft Teams), using topic guides

developed from the implementation literature (Normalisation Process Theory – NPT)[ii] to understand whether and how new technologies and work processes become embedded and part of routine practice; supplemented with documentary research (i.e. analysis of HInM Key Performance Indicators documentation and training materials). Interviews conducted over eight months between August 2020 and March 2021.

Analysis

Audio-recordings of interviews transcribed, exported to NVivo 12 Pro software for data management[iii]. Analysis concurrent with and informed by data collection (and vice versa). Transcripts thematically analysed using Template Analysis[iv] guided by NPT.

Final sample

Fifty one in-depth interviews comprising – 24 care home staff (mainly managers), 10 clinicians and nine locality leads across four GM localities – and eight HInM implementation staff.

[ii] May CR, Mair F, Finch T, et al. Development of a theory of implementation and integration: Normalization Process Theory. Implement Sci 2009; 4: 29.
[iii] QSR International Pty Ltd. NVivo qualitative data analysis software Version 12 Pro. 2018.
[iv] King N. Using templates in the thematic analysis of text. In: Cassell C, Symon G, eds. Essential Guide to Qualitative Methods in Organizational Research London: Sage Publications, 2012: 256-270.

Appendix 3: Description of Localities (Qualitative Evaluation Sites)

GM Locality	Care homes using COVID-19 symptom tracker (at time of interviews)	Stakeholders involved in implementation of tracker and their roles	Training received by care home interview participants
Locality 1	7 care homes of approximately 50 in the locality – 'Phase 1' roll-out; all volunteers.	**Clinicians:** No single GP practice covering care homes; some practices aligned with particular homes but generally different GP practices covered different residents. Low interest in tracker among GPs. **CCG:** Involved in some brokering of relationships with care homes and informal follow-up. **LA:** Mainly assisted in helping to provide digital kit to homes.	'Light-touch' training delivered to homes consisting of tech-focused 'on-boarding'; delivered by Safe Steps staff; little follow-up; some home staff attended online workshop.
Locality 2	Majority of homes of approximately 40 in the locality; mandatory roll-out.	**Clinicians:** Prior to roll-out all care homes already remotely supported by a digital hub of clinical staff. Hub backed by mature digital reporting systems, a geriatrician and GP closely involved in developing/piloting both the falls app and the COVID-19 symptom tracker in a small number of locality homes, and linking with a team of community pharmacists. Strong interest in tracker among clinicians. **LA:** Involved in brokering of relationships with care homes, promotion of tracker and follow-up of homes.	Two types of training delivered: a) Initial 'light- touch' consisting of rapid tech-focused 'on-boarding' in early adopter homes; delivered by Safe Steps staff supported by 'help' pages; b) Later 'in-depth' consisting of 'education-based' model in remaining homes with purpose-made training manual and slide set developed by HInM trainers; delivered jointly by HInM trainers and Safe Steps; intensive follow-up call system to support homes.
Locality 3	11 care homes of approximately 40 in locality – 'Phase 1' roll-out; identified as 'more engaged'. Joined by 12 further care homes in 'Phase 2' roll-out.	**Clinicians:** One GP practice covered residents in most of the locality's homes; co-located with palliative care/dementia nursing staff and pharmacist. Lead GP supportive in principle of tracker. Digital infrastructure challenged. **LCO**: Remit for care home quality; involved in brokering relationships with homes. **Health improvement agency:** Project management of roll-out; follow-up of homes post on-boarding; tracking data input.	In-depth training delivered consisting of online group-based webinar session using resources developed under model in Locality 2; delivered by HInM trainers; telephone follow-up; one-to-one session sometimes offered if homes missed webinar.

Locality 4	**7 care homes of approximately 40 in the locality – 'Phase 1' rollout; all volunteers.**	**Clinicians: No single clinical team linking with homes but multiple GP practices covering different residents. Low engagement among GPs; digital infrastructure challenged. Team of nurses/AHPs providing support to homes for COVID-19 response but minimal use of tracker.** **LA: Involved in brokering relationships with homes and project set-up; follow-up of homes post on-boarding for support, data monitoring and compliance.** **CCG: Engaging PCNs to promote tracker; linking with LA.**	**'Light-touch' training delivered to homes consisting of tech-focused 'on-boarding' model; delivered by Safe Steps staff; little follow-up.**

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