Table S1: Responses to the NoMAD survey instrument

When considering taking measurements and recording data on residents' health using a tablet computer	
General views	67% (28) felt that the intervention was worthwhile 88% (37) could see the potential value of the intervention
How does the intervention fit with current work?	81% (34) felt familiar with the intervention 83% (35) saw it as a normal part of their work 76% (32) felt that use of the tablets could be easily incorporated into their existing work 83 % (35) felt that it was a legitimate part of their role 100% (42) felt that it will become a normal part of their work in the future 86% (36) understood how it affected the nature of their own work 76% (32) felt that staff had a shared understanding of the purpose of the intervention 88% (37) were open to working in new ways with colleagues 88% (37) would continue to support use of the tablets to record data on residents' health 67% (28) valued the effect of the intervention on their own work 24% (10) felt that using the tablet computer to record data disrupts working relationships 69% (29) felt that they can modify how they work with the intervention
How does the intervention fit with current work?	65-74% • valued the effect of the intervention on their own work • felt that they can modify how they work with the intervention 75%+ • All the remaining statements including 'felt that using the tablet computer to record data does not disrupt working relationships' • These could be ordered, in ascending order of % response, or in an order that makes sense because it groups tasks.
Support and training	86% (36) judged that management adequately supported the intervention 81% (34) felt that sufficient training is provided to enable the staff to implement the intervention 86% (36) reported that work is allocated to people with the skills to use the equipment 67% (28) had confidence in other people's ability to use the tablet computers to record information 67% (28) felt that there were key people were driving the intervention and getting others involved. 90%(38) agreed that feedback can be used to improve the intervention in the future

Box S1: Survey instrument

The Normalisation MeAsure Development (NoMAD) [1] survey instrument was used to broaden the scope of the evaluation to include data from an increased number of care homes. The NoMAD is based on NPT and is designed to gauge the perspectives of people directly involved in the implementation of healthcare interventions. We used the NoMAD to a) to elicit care home staffs' views on how the intervention had impacted on their work and whether they believed it could form a routine part of their work; and b) to identify areas where the implementation could be improved. While the use of the NEWS is explicitly mentioned within the introduction the wording of survey questions typically emphasised the use of the tablet computer as opposed to NEWS.

Survey Distribution and analysis

Four paper copies of the survey with information sheets and pre-paid return envelopes, were sent to care home managers. Electronic copies were also sent by email. Managers were asked to distribute the survey to staff involved in the intervention. Information sheets detailed a) the purpose of the evaluation b) that participation was voluntary c) and that completion and return of the survey constituted consent. The survey questions invited responses on multi-point scales. Positive responses (agree and strongly agree) were aggregated.

Findings

Forty-two surveys were returned from 22 care homes. One of these homes had also participated in the qualitative component of the evaluation.

Twenty-one (50%) of responses came from carers, 19 (45%) from home managers/deputy managers, and two (5%) from registered nurses without managerial responsibilities. A small majority (57%) of respondents were directly involved in taking observations, with 43% overseeing such staff. The respondents' collective experience of care work was substantial, with 74% having worked in the care sector for 10 years or more, and 48% had been employed by their current care home for a similar time.

A majority of the respondents were supportive of the current and future use of the intervention. The areas where there were fewest positive responses were; sufficient training, confidence in others' ability, ease of incorporation into existing work and a shared understanding of the purpose of the intervention amongst staff. Further findings are detailed in Table S1.

References

1. Finch et al., 2013. Improving the normalization of complex interventions: measure development based on normalization process theory (NoMAD): study protocol. Implementation Science 2013, 8:43.

Appendix S1: Topic Guides

Topic Guide: Care Home Staff views *Version 1. Date: 12.04.18*

Phase of the interview	Check list / Questions
Introduction	1. Introduce yourself as a researcher from Newcastle University and iterate the purpose of the study. 2. Offer the participant the opportunity to ask questions. 3. Remind the participant that all information remains confidential, and that they are free to stop the interview and withdraw at any time. 4. Obtain consent to proceed and to audio record the conversation – remember to ensure both copies of the consent form are signed and dated and give the participant their copy. 5. Ensure the participant is comfortable and commence the interview.
Rapport building	1. *So tell me a little about yourself?* Probes: How long have you worked in the care sector? How long have you worked in [Care home name]? What's it like working here? o Workload o Residents o Staff [**remind participant that the interview is confidential**] o Atmosphere
Core questions	*As I mentioned earlier, we're keen to learn your thoughts on the recording and sharing of data on resident's health.* **Could you tell me what you think about this?** 1. When did you first become aware this was going to be introduced here? • Who informed you? • Do you recall how they were described? 2. How did you feel about recording the health of residents in this way? 3. How about taking patient's blood pressure/breath count? 4. Were you familiar with tablet computers before they were used in [care home]? • Do you have any thoughts or feelings about such devices generally? 5. [if not already discussed] Did you receive any training? • What was this training like? • Did you have any questions for concerns? • Were these answered? 6. When do you take the readings? • Weekly? • When concerned about a patient? • *Why is this?* 7. Are you aware of whether residents and their families were informed about the introduction of the tablets? • Are you aware of their views about the tablets? 8. If you could change anything about how the tablets were first implemented, what would that be? • Could you explain that further? / Why do you feel that way?

	9. Has your opinion regarding recording data on resident's health changed over time? • Could you explain that further? / Why did you feel that way? 10. What impact, if any, has this had on your workload? • Could you explain that further? / Why did you feel that way? 11. What impact, if any, has it had on the care provided at [care home]? • Could you explain that further? / Why did you feel that way? 12. What has it been like sharing data with associated healthcare professionals outside of the care home? • Could you explain that further? / Why did you feel that way? 13. What are your thoughts on the use of National Early Warning Score (NEWS) within this intervention? 14. How about the Malnutrition Universal Screening Tool (MUST)? 11. And the Abbey Pain Score? 15. Is there anything else you would like to tell me about the care you provide here? • Could you explain that further? / Why do you feel that way?
Wrapping up	16. Is there anything else you'd like to add to what we have discussed? 17. Do you have any questions about what we have discussed?
Close	18. Thank the participant for their time.

Topic Guide*:* Healthcare Professionals views *Version 1. Date: 12.04.18*

Phase of the interview	**Check list / Questions**
Introduction	6. Introduce yourself as a researcher from Newcastle University and iterate the purpose of the study. 7. Offer the participant the opportunity to ask questions. 8. Remind the participant that all information remains confidential, and that they are free to stop the interview and withdraw at any time. 9. Obtain consent to proceed and to audio record the conversation 10. Ensure the participant is comfortable and commence the interview.
Rapport building	2. *So tell me a little about yourself?* Probes: How long have you worked in healthcare? • In this particular role? What's it like working in [place of work]? ○ Typical day ○ Workload ○ Types of cases ○ Staff [**remind participant that the interview is confidential**] ○ Atmosphere
Core questions	*As I mentioned earlier, we're keen to learn your thoughts on the tablet computers to record and share health data on the health of care home residents.* 19. When did you first become aware that the care homes were going to start using tablet computers to record and share data on the health of their residents? • Who informed you? • Do you recall how this intervention was described? • What were your initial thoughts about this intervention? ○ Have these thoughts changed? ○ Could you expand on that/explain further?

	20. Could you tell me how you usually communicate with other organisations outside of the NHS, like the care homes? • Barriers/facilitators to these communications? • How, if at all, has the digitisation of data sharing, and the use of tablet computers impacted upon this? • How about your workload? 21. If you could change anything about how this intervention was first implemented, what would that be? • Could you explain that further? / Why do you feel that way? 22. [If not answered by Q3] If you could change anything about the intervention as a whole, what would that be? • Could you explain that further? / Why do you feel that way? 23. What are your thoughts on the use of National Early Warning Score (NEWS) within this intervention? 24. How about the Malnutrition Universal Screening Tool (MUST)? 25. And the Abbey Pain Score?
	26. What impact, if any, do you think the intervention has had on the care provided in care homes? • Could you explain that further? / Why did you feel that way?
	27. Is there anything else you would like to tell me about the intervention? • Could you explain that further? / Why do you feel that way?
Wrapping up	28. Is there anything else you'd like to add to what we have discussed? 29. Do you have any questions about what we have discussed?
Close	30. Thank the participant for their time.

Table S2: Evaluation findings against NPT constructs

NPT Construct	Related Findings	
Coherence: The sense-making work that people do individually and collectively when they are faced with the problem of operationalizing some set of practices. Coherence includes: **Differentiation:** Understanding how a set of practices and their objects are different from each other. **Communal specification:** People working together to build a shared understanding of the aims, objectives, and expected benefits of a set of practices. **Individual specification:** Doing things that will assist understanding of specific tasks and responsibilities around a set of practice. **Internalization:** Understanding the value, benefits and importance of a set of practices.	**Evidence of Coherence:** • Staff within engaged homes recognised that NEWS differed from other care work, particularly in the taking of vital signs observations and sharing objective information.	**Evidence of a lack of Coherence:** • The majority of homes were not engaging regularly with the intervention (communal specification and internalization). • Vital signs observations could be taken in inappropriate contexts (e.g. noisy environments; after a resident had been active; using a pulse oximeter on a resident who is wearing nail varnish) and opportunistically (differentiation; internalisation). • Care homes varied in their use of the equipment, sometimes failing to utilise it as intended (communal specification). • Not all external services were aware of NEWS and some had not altered pre-existing triage protocol across stakeholder groups (communal specification) • NEWS implementation occurred over short space of time with a limited provision of support (limiting the potential for sense-making work).
Cognitive Participation: the relational work that people do to build and sustain a community of practice around a new technology or complex intervention. Cognitive Participation includes: **Initiation:** Key participants working to drive new practices them forward. **Enrolment:** The organization or reorganization of participants and others in order to collectively contribute to the work involved in new practices.	**Evidence of Cognitive Participation:** • Care homes that were perceived of as successful by CCG staff and health professionals were those with long-term managers and a core body of long serving staff.	**Evidence of a lack of Cognitive Participation:** • The majority of homes were not engaging regularly with the intervention. • Changes in management and high staff turnover as well as variation of staff skills within and across the care homes created barriers to initiation and enrolment. • NEWS related support provided to care homes from health professionals was impromptu as opposed to an integrated part of the intervention (activation and enrolment) • The legitimacy of staff taking vital signs observations was questioned. Care home staff and health professionals questioned taking vital signs

Legitimation: The work of ensuring that other participants believe it is right for them to be involved, and that they can make a valid contribution to it. **Activation**: Collectively defining the actions and procedures needed to sustain a practice and to stay involved.		based on limited training while health professionals questioned the appropriacy of placing further demands and responsibility onto beleaguered and low paid care home staff.
Collective Action: the operational work that people do to enact a set of practices, whether these represent a new technology or complex healthcare intervention. Collective Action includes: **Interactional workability**: The interactional work that people do with each other, with artefacts, and with other elements of a set of practices, when they seek to operationalize them in everyday settings. **Relational integration:** The knowledge work that people do to build accountability and maintain confidence in a set of practices and in each other as they use them. **Skill set workability:** the allocation work that underpins the division of labour that is built up around a set of practices as they are operationalized in the real world. **Contextual Integration:** Resource work - managing a set of practices through the allocation of different kinds of resources and the execution of protocols, policies and procedures.	**Evidence of Collective Action:** • Care homes were provided with impromptu support by external health professionals • Care home staff supported colleagues with NEWS.	**Evidence of a lack of Collective Action**: • Care home staff described not being fully aware of all aspects of the intervention at the outset or being given inaccurate information (interactional workability) • Care home staff voiced frustrations at services not always being aware of the NEWS. Care home staff and one specialist nurse reported that services did not always listen to, or take account of the knowledge and views of care home staff in regard to their residents. Care home staff highlighted problems with equipment failures and instances of external services questioning accuracy of the NEWS equipment (relational integration; interactional workability). • Responsibility for using the NEWS equipment varied across the care homes, often with only certain members of staff being trained and tasked with using the equipment which opposed the view of some health professionals who assumed all staff were trained. • Health professionals questioned the ability of care home staff to take vital signs observations. Both health professionals and care home staff highlighted the challenges of undertaking vital signs observations within the care home setting, for example, a resident's not consenting or becoming distressed by NEWS equipment, noisy environments, competing priorities (skill set workability).

		• Care homes varied in their use of the equipment, sometimes failing to utilise it as intended (e.g. not calculating a NEWS; not maintaining monthly readings) and some services remained unaware of the NEWS intervention or had not amended processes to account for NEWS (contextual integration).
Reflexive Monitoring: is the appraisal work that people do to assess and understand the ways that a new set of practices affect them and others around them. Reflexive Monitoring includes: **Systematization**: The work of seeking to determine how effective and useful the intervention is for them and for others, and this involves the work of collecting information in a variety of ways, formally and informally. **Communal appraisal**: Participants working together - sometimes in formal collaboratives, sometimes in informal groups to evaluate the worth of a set of practices. **Individual appraisal:** participants individually appraising an intervention's effects on them and the contexts in which they are set - appraising not only the worth of the program, but also its impact on her/his other tasks**.** **Reconfiguration**: appraisal work by individuals or groups leading to attempts to redefine procedures or modify practices.	**Evidence of Reflexive Monitoring** • The CCG employee providing support to the care homes kept informal notes on the progress and challenges of and face by the care homes. These were feedback to the CCG in appraisal meetings • Care home staff described positive experiences of using NEWS and commented on improved communication with some services and increased confidence within such communications (individual appraisal).	**Evidence of a lack of Reflective Monitoring:** • Neither care home staff nor the external health professionals working directly with the care homes, were involved in appraisal meetings with the CCG. Concerns of care home staff were typically fed back to the CCG via a third party. As such they had no direct say in discussions on barriers to the implementation nor in discussing possible improvements (communal appraisal and reconfiguration). • Health professionals felt that some care homes faced difficulties with pre-existing care tasks and NEWS would be potentially inappropriate for such homes and some care home staff and health professionals commented on NEWS being time consuming, impacting on other work and reducing time spent with other residents. Providing care home staff with impromptu support with NEWS also added to health professional's workloads and caused frustration (individual appraisal).

Table S3: Care Home Participants

Care Home	No. of Interviewees	Job Role	Time in Current Post	Perceived Engagement with NEWS****
Care Home 1 Nursing 40+ beds	3	Nursing Assistant	9 years	Engaged
		Carer	18 years	
		Nurse	3 years *	
Care Home 2 Residential 50+ beds	3	Senior Carer	5 years	Inconsistent
		Senior Carer	15 years	
		Manager	3 years	
Care Home 3 Residential 25+beds	3	Senior Carer	5 months**	Inconsistent
		Manager	1 year***	
		Carer	2.5 years	
Care Home 4 Residential 30+ beds	2	Deputy Manager	15 years	Engaged
		Deputy Manager	10 years	
Care Home 5 Residential 25+ beds	3	Manager	25 years	Engaged
		Senior Carer	7 years	
		Carer	4 years	
Care home 6 Residential 20+beds	1	Deputy Manager	3 years	Engaged
Total	**15**			

* Worked as a nurse for 25 years
** 6 years as a senior carer elsewhere
*** Worked in the sector for 28 years
**** CCG perceptions of care home engagement

Box S2: Additional information on recruitment and data collection

The timescale for this evaluation was limited to four months. This limited the time available for recruitment and data collection.

The research team aimed to interview multiple GPs. However, GPs proved to be difficult to recruit being either non-responsive to requests or unavailable due to busy schedules or annual leave (recruitment and data occurred during summer months). GPs who did respond often felt that they were not familiar enough with the intervention, or that care home staff did not mention the NEWS when contacting them, again limiting participation of this group.

Exploring the views of primary care teams towards the use of NEWS in care homes would be a valuable piece of future research.