An Evaluation of Invisible Systems Implementation in Suffolk Primary Care: A Case Study

Document Control

Case Study

Introduction

This local project fulfils the Office of Life Sciences and NHS England deliverables given to Eastern AHSN to deliver innovation into the NHS. Eastern AHSN supported Suffolk Primary Care (SPC), a partnership of fourteen GP Practices, to implement the Invisible Systems sensors across the partnership.

Invisible System uses wireless internet of things sensors to collect data from the GP Practices medical fridges as well as electricity and gas usage in the building, and then converts data into intelligence via an online dashboard, giving GP Practices and SPC insight into temperature monitoring as well as overall energy usage. The key benefits of interest to SPC were being able to monitor fridge temperatures better; staff efficiency savings, realised by eliminating the need for manual fridge temperature checks; decreases in medication wastage, intended by acting on alerts to fridges going out of temperature range and enabling prompt intervention; and insight into energy usage across the partnership. All these benefits are assessed in the case study below using practice-level data.

The aim of this case study is to collate learning from the implementation phase that took place between May 2020 and September 2021, using information derived from quantitative data provided by Invisible Systems and SPC and qualitative data from three semi-structured interviews with stakeholders from a variety of operational roles.

The methodology used for the individual evaluation metrics is described in each section throughout the case study.

Case study structure

This case study presents an encouraging example of a partnership of GP Practices adopting Invisible Systems across fourteen GP Practices derived from the qualitative interview data, as well as the initial findings from the quantitative data. The case study follows the following structure, based on the key intended benefits:

Process of Implementation: Interview Analysis

Staff Efficiency Savings

Insight into Energy Usage

Decrease in Medicine Wastage

Conclusions and recommendations

Analysis of Process of Implementation Interviews

Eastern AHSN intended to identify up to six people who had been involved in the implementation of Invisible Systems to take part in one-to-one semi-structured interviews. Working with SPC, we asked SPC to identify practice managers and SPC managers who had overseen the implementation of Invisible Systems and who had different perspectives on implementation and effectiveness. However, only five names were put forward to the Eastern AHSN team. Several practice managers had since left the GP practices and other practices

were undergoing mergers, which were time-consuming. As such, the SPC did not want to ask them to participate in this evaluation and place additional pressure on their time. Of the five suggested and contacted, two were SPC managers and three were practice managers. Only one of the suggested practice managers was interviewed, as the others did not feel they had capacity to take part due to pressures caused by Covid-19.

This resulted in Eastern AHSN interviewing three people: The Infrastructure and Projects Manager, SPC; the Estates Administrator, SPC and a Practice Manager from one of the GP Practices that implemented invisible systems. Therefore, these findings are limited. Only the views of one practice manager overseeing implementation at practice-level are included. While the views of SPC managers are useful, they represent views on implementation and effectiveness from a partnership of GP Practices rather than an individual practice perspective – where the drivers for implementation, as well as day-to-day project delivery, are quite different.

Given these limitations, it is important not to over-interpret the interview findings. We have endeavoured to appropriately caveat the results in what follows.

The table below sets out the interview questions.

Table 1 shows the 'Understanding the Process: Implementing Invisible Systems in Primary Care' interview questions.

#	Question
1	Welcome & introductions.
2	Please talk us through why you implemented Invisible Systems in SPC/ at your GP practice.
3	What steps or processes did you take to implement Invisible Systems in SPC/ into your GP practice?
4	What were the enablers?
5	Were there any barriers?
6	Were there any unexpected impacts or consequences?
7	Is there anything that you would have done differently?
8	What advice would you give to other GP practices that are about to implement Invisible Systems?
9	Did you achieve what you set out to achieve?
10	Anything else you would like to add?

Rationale for implementing Invisible Systems

When asked about the **reasons why the interviewees implemented Invisible Systems** across the GP Practices, all three interviewees referenced the **temperature monitoring**

rationale above anything else. This included comments around real-time monitoring, out of hours monitoring and how Invisible Systems helps with CQC compliance for temperature monitoring; all with the rationale to reduce temperature breaches and subsequent medicines wastages in the GP practices.

"Traditional methods do not give intel into temperature issues, particularly over the weekend and many times we would find breaches have happened when arriving back at work on a Monday".

Interviewees from SPC also referred to an aim to have a more **centrally managed monitoring system** across one or multiple GP Practices, particularly across the partnership. The intention was to move to a more proactive rather than reactive estates management approach to fridge temperature monitoring in primary care.

"At the AHSN Innovation event, we went to see what was out there generally. The information and demo of IS was good, we liked the concept and when considering what we do across GP Practices, it looked good and met our needs".

"We were interested in Invisible Systems mainly because traditional methods do not give intel into temperature issues, particularly over the weekend and many times we would find breaches have happened when arriving at work on a Monday. Invisible Systems gives a real time warning and flags issues/reports in real time therefore this was the main reason why – particularly with the C19 vaccines in the fridges".

Both the SPC interviewees referred to gaining a **better insight of energy usage** across the SPC. However, the practice manager interviewed felt that monitoring energy usage was a concern for SPC rather than individual practices, and it did not factor into their own success criteria or intended benefits for the project.

Process and individual steps taken during implementation SPC-level

When asked what steps or processes were taken when implementing Invisible Systems across primary care, the responses varied depending on the role. Those responsible for implementing Invisible Systems at SPC-level mentioned the importance of **looking at each practice individually** to decide how best to implement, including:

- Checking the **age and compatibility** of the current energy meters, and if not to work with the local supplier to update the meters. SPC found that some of the **utility meters were not compatible** with Invisible Systems due to their old age and therefore the SPC team had to work with the local energy suppliers to upgrade the meters which subsequently delayed implementation in a handful of GP Practices.
- Looking at the **size of each practice** and whether a particular practice hosted a high number of fridges and therefore may benefit from a system like Invisible Systems the most.
- Subsequently work closely with the **Invisible Systems team of engineers** to arrange installing the hardware at the individual practices.

A system for fridge temperature monitoring that has any issues or risks may be critical for vaccines and therefore it is important for the system to have an **accessible and supportive help desk** in the event of technical/mechanical faults. Interestingly, the two interviewees from SPC had a difference in opinion on how accessible and supportive the Invisible Systems helpdesk was and therefore individual roles and the timings of the experience may influence people's opinion. One interviewee from SPC who was not involved in the initial stages of the project mentioned how accessible the Invisible System help desk was when an issue was raised with prompt responses. In contrast, another interviewee who was involved in the project from the start said that the Invisible System help desk in the initial stages had a slow

process of submitting a support ticket, requiring different portal log ins and therefore acted as a barrier and slowed down the instances of potential critical issues that needed to be resolved. Fortunately, Invisible System took this feedback on board during the implementation stage and have now removed the need to log in to a portal and have now provided a direct email to the help desk, and so the difference in experiences may be due to the changes made over time by Invisible Systems but this is only an assumption.

Process and individual steps taken during implementation at GP Practice-level

Those responsible for implementing Invisible Systems at GP Practice-level mentioned the following advice for implementation:

- **Advocating Invisible Systems** across the GP Practice to colleagues and to help with **communication** about the change in fridge temperature monitoring procedures.
- One interviewee said that they didn't have time to complete the formal training or read the manual thoroughly and therefore approached the learning by self-teaching. But on reflection would advise for GP Practices implementing Invisible System in the future to set aside dedicated time to **complete the formal training** and include staff/colleagues too.
- Another important step including the **configuration settings**, and the importance of setting these up prior to using Invisible Systems. These settings include the sensitivity and frequency of alerts once a temperature had been breached, escalation to named members of staff, frequency of reports and the duration of time after a breach has happened for a breach alert to be sent.

"We had one situation where a fridge temperature dropped significantly, and we therefore lost some AstraZeneca Coronavirus 19 vaccines due to a prolonged temperature breach. This led us to question whether the frequency of the notifications was not high enough to report a temperature breach. Therefore, we increased the frequency of notifications to prevent having to manually monitor the live dashboard, particularly out of hours. But we then thought that the frequency of alerts was too high and so we reduced it back again. Therefore, there has been a lot of tweaking as time has gone by which may act as a barrier for people taking a liking to Invisible System".

"In the early stages we did compare the temperature monitoring sheets and Invisible System to check for consistency. We also had to reduce the frequency of the alerts as it was flagging all breaches in temperature. A fridge temperature of 2 – 8 degrees is standard, but the temperature could go above 8 degrees if a nurse opened the fridge and this wasn't a significant breach and so we would wait to see if there was another alert later to understand if it was just a short change in temperature or a long/significant breach which required action. Regarding risks, we learned through the system that anything above temperature range for 20 mins will damage most vaccines. And for vaccines that need to be at a lower temperature, that time is shorter".

The most common point raised from all three interviewees was **how straightforward the software is to learn and manage**, and consequently helped sell the idea to colleagues across the GP Practices who reacted positively.

"Trust in the software is important, and I trust Invisible Systems, mainly because the software is relatively straight forward which is helpful. Staff were positive overall to take on board the system, therefore made the process of embedding Invisible System easy".

One common theme that all three interviewees mentioned was about the importance of the **training and understanding of Invisible Systems**. The SPC staff did complete the Invisible Systems training and read the manuals and spoke about how they found it helpful and strongly advise others to do so prior to implementation. Two interviewees referenced the importance of

confidence building once the system was up and running as an important part of the implementation process and added that this mainly came over time once they had used Invisible Systems a lot more.

Reflecting on doing things differently and advice to other GP Practices

In terms of anything that the interviewees would have done differently to advise towards future implementation across other primary care settings, the responses were broadly similar. The most common discussion point that was raised by all three interviewees was about advising those considering adopting Invisible Systems to **spend more time prior to implementation on Invisible System training** to become familiar with all aspects of the system and to spend time setting the configurations correctly, such as setting the temperature breaches notifications which is usually anywhere between twenty to sixty minutes, as this will then suit the day-to-day running of the practice and prevent staff from disliking a new system.

It was also clear that the **timing of when to implement** a new system can influence the usage and uptake of Invisible Systems.

"The coronavirus pandemic may not have been the best time for implementation due to staff shortages and pressures. Perhaps after a flu season would be best as this is when GP Practices may have more capacity, as it is good to get buy in from all staff members".

Another interviewee gave advice to primary care settings considering implementing Invisible Systems across **multiple sites**.

"We implemented this across a number of GP Practices, and I would recommend to start very small with one or a few practices and then scale up over time, as there might be issues / teething problems at the start such as incompatible meters, configuration queries and usage questions from members of staff".

Overall, the interviews provide some insight into implementing Invisible Systems across primary care settings, reflecting a relatively positive experience. While findings are limited by the small number of interviewees, it is important to note that SPC has adopted Invisible Systems into their routine practice and the board approved for all fourteen GP practices to stop manually monitoring fridge temperatures – instead solely relying on Invisible Systems. This shows the level of trust in the system.

"Invisible System has also enabled us to report the overall temperature monitoring into our information governance committee and they can monitor it overall too. As a partnership, we feel more proactive and preventative now and able to advise practices on temp monitoring with an aim to prevent temperature breaches and medicines wastages".

Staff Efficiency Savings

In order to assess staff efficiency savings, we examined the staff time spent on fridge temperature monitoring before Invisible Systems was implemented. Throughout June 2021 the fourteen GP Practices were asked to record how much time they spent completing manual checks of medical fridges.

However, despite asking for data from fourteen practices (with a total of forty-eight fridges) only one practice (with a total of six fridges) provided data. SPC felt that the dataset from six fridges is likely to represent similar data from other practices, but Eastern AHSN was unable to confirm this.

Table 2 shows the fridge temperature monitoring averages throughout June 2021 from six fridges provided by one GP Practice.

| Date | Time averages | Temperature | | | Role | Time taken to complete check averages (minutes) |
		Current temp averages (degrees)	Min temp averages (degrees)	Max temp averages (degrees)		
09/06/2021	08:37:00	4.0	3.5	5.0	HCA	1.5
10/06/2021	08:16:40	3.8	3.5	5.4	HCA	1.5
11/06/2021	08:03:40	4.0	3.5	5.0	HCA	1.5
12/06/2021	08:09:40	4.0	3.5	4.9	HCA	1.5
14/06/2021	08:33:00	3.9	3.5	4.9	HCA	1.5
15/06/2021	08:36:00	3.9	3.4	6.5	HCA	1.5
16/06/2021	08:32:20	4.1	3.5	5.5	HCA	1.5
17/06/2021	08:20:50	4.3	3.5	5.5	HCA	1.5
18/06/2021	08:20:40	4.0	3.5	6.7	HCA	1.5
19/06/2021	08:19:00	3.9	3.5	5.1	HCA	1.5
21/06/2021	08:30:30	3.8	3.4	6.6	HCA	1.5
22/06/2021	08:21:50	3.7	3.5	5.2	HCA	1.5
23/06/2021	08:33:10	4.0	3.5	5.0	HCA	1.5
24/06/2021	08:22:10	3.9	3.5	4.9	HCA	1.5
25/06/2021	08:25:50	4.3	3.5	5.3	HCA	1.5
26/06/2021	08:18:30	4.2	3.5	5.0	HCA	1.5
28/06/2021	08:30:10	4.0	3.6	5.0	HCA	1.5
29/06/2021	08:20:50	4.0	3.6	6.3	HCA	1.5
30/06/2021	08:32:30	3.8	3.6	5.6	HCA	1.5
Average	**08:24:26**	**4.0**	**3.5**	**5.4**	**HCA**	**1.5**

Table 3 shows estimated time spent per year on staff completing manual temperature monitoring checks using the averages from Table 2.

Time Parameter	Total time
Total time (hours) per fridge - 1 month	28 minutes 30 seconds
Total time (hours) per fridge - 12 months	5 hours 31 minutes
Total time (hours) 48 fridges – 1 month	22 hours 48 minutes
Total time (hours) 48 fridges – 12 months	**273 hours 36 minutes**

Table 4 shows the estimated cost spent per year on staff completing manual temperature monitoring checks the average from Table 2.

Cost parameter	Total cost	
HCA band 2 cost[1] (including on costs) per month - 1 fridge	£	6.09
HCA band 2 cost (including on costs) per year - 1 fridge	£	73.07
HCA band 2 cost (including on costs) per month - 48 fridges	£	292.30
HCA band 2 cost (including on costs) per year - 48 fridges	**£**	**3,507.55**

[1] https://www.healthcareers.nhs.uk/working-health/working-nhs/nhs-pay-and-benefits/agenda-change-pay-rates/agenda-change-pay-rates

Table 2, 3 and 4 provide an indicative time and cost efficiency saving that Invisible Systems can provide across singular or multiple fridges scaled up over one and twelve months. Using the data from June 2021, it is estimated that SPC will save 273 hours and 36 minutes of staff time per year, amounting to £3,507 of Health Care Assistant (HCA) costs across the fourteen GP Practices that are using Invisible Systems in forty-eight fridges.

If these figures were applied across the entire Eastern region (assuming SPC may represent an average across GP Practices), this could be potential savings of 12,351 hours and 6 minutes of staff time per year, amounting to £158,340 of HCA costs per year[2].

It is important to note that this analysis is very limited given that data was only provided by one GP Practice, and should be seen as indicative only.

As noted above, the SPC Board have made the decision to solely rely on Invisible Systems for fridge temperature monitoring rather than use manual recording therefore the time and cost savings above will come into effect immediately.

Insight into Energy Usage

One of the advantages that Invisible Systems offers is that it gives the user insight into energy usage allowing individual and multi-sites to become smarter, greener, and more cost effective. For this evaluation metric, the methodology included extracted data from Invisible Systems between January and June 2021 which is displayed in tables 5 and 6. The data includes: the number of fridges per surgery, energy and gas usage, floor area (m2), average Kwh and average Kwh per m2.

There are many factors why one GP Practice may be using more energy than another and should be considered when analysing the energy usage extracted from Invisible Systems. These include the type and age of the building, type of energy and gas meters, equipment and procedures used in the practice that may subsequently affect energy usage. Given this, SPC do not intend to use this data to compare practices, but rather to establish a baseline of energy usage per practice and monitor trends over time – enabling intervention if energy usage changes unexpectedly.

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[2] Figures based using the data from Tables 3 and 4 to calculate an approximate average number of fridges per GP Practice (3.4) and to scale this up across 632 GP Practices the East Integrated Care Systems including: Cambridge and Peterborough; Norfolk and Waveney; Suffolk and North East Essex; Milton Keynes, Bedfordshire and Luton; Hertfordshire and West Essex and Mid and South Essex.

Table 5 shows the energy consumption in Kwh for electricity.

Site	No. of fridges	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Floor area m2	Average (KwH)	Average KwH per m2
Brandon Surgery	2	1060	983	1057	952	1003	997	170	1009	5.9
Chesterfield Drive	4	10027	9170	9148	7530	6066	4370	530	7719	14.6
Combs Ford Surgery	3	3041	2804	3149	3110	3743	3836	490	3281	6.7
Deben Road	2	2106	1955	2156	1930	1879	1889	355	1986	5.6
Debenham	3	3539	3012	3039	2746	2783	3048	293	3028	10.3
Derby Road	3	5048	4967	4769	4228	4245	4142	355	4567	12.9
Grundisburgh	2	763	697	753	684	680	667	136	707	5.2
Haven Health	3	11347	10041	9852	8143	7692	7717	562	9132	16.2
Howard House	2	5613	5034	4873	4101	2742	2698	705	4177	5.9
Martlesham	2	1448	1446	1564	1398	1316	1391	330	1427	4.3
Norwich Road	3	5008	4711	5273	4714	4661	5188	608	4926	8.1
Oakfield	5									
Otley	2	1126	958	1071	945	876	897	165	979	5.9
Pinewood	3	4282	3674	3930	3496	3516	3438	261	3723	14.3
Stowhealth	7									
The Birches	2	1666	1448	1870	1677	1747	2014	357	1737	4.9
Total	48	56074	50900	52504	45654	42949	42292	5317	48396	120.8
Average	3	4005	3636	3750	3261	3068	3021	380	3457	8.6

Table 6 shows the energy consumption in m3 for gas.

Site	No. of fridges	Jan-21	Feb-21	Mar-21	Apr-21	May-21	Jun-21	Floor area m2	Average (m3)	Average m3 per m2
Brandon Surgery	2	401	302	301	222	120	8	110	226	2.1
Chesterfield Drive	4							530		
Combs Ford Surgery	3	1239	977	947	817	601	165	490	791	1.6
Deben Road	2							355		
Debenham	3							293		
Derby Road	3	1842	1919	1730	1440	1149	8	355	1348	3.8
Grundisburgh	2							136		
Haven Health	3							562		
Howard House	2	99	144	159	118	449	72	705	174	0.2
Martlesham	2	177	159	155	115	41	0	330	108	0.3
Norwich Road	3	670	357	279	261	0	0	608	261	0.4
Oakfield	5									
Otley	2							165		
Pinewood	3	578	481	432	290	190	70	261	340	1.3
Stowhealth	7	2630	2076	1999	1843	755	296	2996		
The Birches	2									
Total	48	7636	6415	6002	5106	3305	619	7896	3247	9.8
Average	3	955	802	750	638	413	77	564	464	1.4

Decrease in Medicine Wastage

The methodology used for evaluating the decrease in medicine wastage involved obtaining insurance claims before and after the implementation of Invisible Systems to ascertain the difference that Invisible Systems made on medicine wastage. Data was collected from the insurance company between July 2019 and June 2020 for baseline data, and July 2020-June 2021 for follow-up data. *Table 7 shows the difference in medicine wastage via insurance claims pre- and post-Implementation.*

Pre-Invisible Systems July 2019 - June 2020			Post-Invisible Systems July 2020 - June 2021		
Date	**Amount**		**Date**	**Amount**	
25/04/2020	£	585.00	08/08/2020	£	1,580.00
10/06/2020	£	3,022.00	05/08/2020	£	2,778.00
Sum	**£**	**3,607.00**	**Sum**	**£**	**4,358.00**
			Sum change	**£**	**751.00**

This data shows that medicines wastage increased post-implementation. However, the number of insurance claims pre-implementation was very low, providing an ineffective baseline. Eastern AHSN did not have access to this baseline data at the outset of the evaluation design. It was not possible to extend the baseline period before July 2019 as prior to this, practices held individual insurance policies and SPC do not have access to this data. Therefore, this data is very limited and does not adequately measure the impact on this intended benefit.

Conclusions and recommendations

In conclusion, this evaluative case study on implementing Invisible Systems with SPC provides learning about the implementation of a temperature monitoring system within a primary care setting. The adoption across fourteen GP Practices in SPC has been relatively positive - reflected in the interviews and through analysis of emerging data.

Our analysis has been limited by a small sample of interviewees and lack of data from participating practices – both of which were caused by limited capacity in primary care. Any system looking to implement Invisible Systems would need to undertake its own assessment of benefits and ensure appropriate baseline data is in place at the start.

However, despite these limitations we have identified useful learning for others looking to implement Invisible Systems in a primary care setting:

- Assess each practice individually with relation to compatibility of current meters
- Consider the scale of benefit for each practice – particularly regarding the number of fridges and time spent on monitoring activities
- Ensure adequate training is undertaken so key stakeholders have a good understanding of the system prior to implementation
- Ensure the system is configured appropriately – including the sensitivity and frequency of alerts.
- Ensure adequate time is devoted to developing protocols at the outset regarding who is contacted in the event of a breach, alert escalation procedures, frequency of reports, and time required out of range for an alert to be triggered.

We hope this case study provides an insight into likely benefits, how they can be measured, and what sites can expect from the implementation process.