





Summary

With mounting pressure on healthcare services, particularly for patients with chronic long-term conditions such as Chronic Obstructive Pulmonary Disease (COPD), heart failure and diabetes, the need for innovative, scalable technology solutions is more pressing than ever. Remote monitoring has been in use in the Inverclyde area with remarkable success since 2009 and has demonstrated its potential to transform healthcare delivery across the wider Glasgow area.

The I-FIVE (Inverclyde Five-G Infrastructure for Virtual-care Enhancement) Project was one of the Connected Care and Wellbeing Theme projects of the 5G SCSP Innovation Fund Programme.

The I-FIVE Project leveraged 5G connectivity to enhance remote patient monitoring services for people with chronic illnesses in Inverclyde and for people in Care Homes. Through innovative use of technology, the project supports patients in their homes and in residential care settings - improving healthcare access, reducing hospital visits, and enabling proactive management of long-term conditions.

The Inverclyde Health and Social Care Partnership (HSCP) has worked in partnership with Docobo Ltd — pioneers in the field of remote patient monitoring — since 2009. The results of a pilot project 'Utilising Telehealth to Facilitate Treatment of Chronic Obstructive Pulmonary Disease (COPD)' was conducted with notable success between August 2009 and August 2010, demonstrating a 78% reduction of hospital admissions from the community over the period. As early as 2010, the Inverclyde pilot suggested that telehealth, or remote patient monitoring, would be an effective aid in shifting the balance of care from the acute to a primary care setting.

Patients on the pilot were triaged and contacted by telephone using the Public Switched Telephone Network (PSTN) in the event of an alert being generated.

continually enhanced and now offers extensive capabilities and features for enhanced remote patient monitoring for both community and care home patients, including the addition of integrated Video Telephony capability to directly contact the patient. Although achievable on 4G, Wi-Fi on broadband has been required to achieve the best quality, which is not always available to patients in deprived communities in the rural Inverclyde area.

The rollout of 5G technology by <u>Vodafone</u> in the Inverclyde area, theoretically offering data speeds upward of 10Mbps, potentially allows the delivery of enhanced remote patient monitoring services, including integrated video telephony to all patients, irrespective of whether they have broadband installed.

The I-FIVE Project continues to remotely monitor community COPD patients but for the project 20 patients have been issued with new 5G Devices to take advantage of the additional capabilities for their ongoing care. In addition, the I-FIVE Project has delivered remote patient monitoring capabilities to patients in two care homes which can accommodate up to 120 patients with multimorbidities.

Moving on 15 years, the Docobo solution has been

In the Care Homes the staff assist the residents to enter

their individual care data separately on devices issued to the care staff. The Care staff can request a video call with the Inverclyde HSCP Clinical Care teams where required directly to the patient. Whereas in the community the patients enter their own data on their personally issued devices and a video call, with the clinician can be initiated, in the event of alerts being generated from the patient data.

This Case Study captures the experiences of both Patients and Staff in the delivery of these new Telehealth Services over the 5G advanced Wireless network. It also addresses the practicalities of implementation and makes an assessment the benefits of the technology for the expansion of remote patient monitoring, including video conferencing, across the Community and further Care Homes in the Inverclyde Region and beyond.

This Case Study focuses upon COPD patients in the community. In addition to vital signs and general health status monitoring for the Care Home patients with multi-morbidities. Upon completion of the I-FIVE project it is intended to expand the implementation to include Heart Failure patients in the community.

The main Project partners are Docobo Ltd and Inverclyde Health and Social Care Partnership (HSCP).

The primary beneficiaries are the COPD and Care Home patients who will benefit from the regular remote monitoring and the video capabilities DOC@HOME offers. Keeping people cared for in their community and a reduction in 999 Calls and A&E and hospital admissions.

Secondary benefits are for the care providers who will see reductions in demand, including social care costs, and reduced anxiety for patient, carers, and family.

The I-FIVE project built upon on a successful remote monitoring pilot project that has been running at Inverclyde HSCP (supported by Docobo Ltd) since 2009. The project uses DOC@HOME, the Docobo remote patient monitoring system which is the UK Marketing leading remote patient monitoring solution.

The original 2010 case study for the first Pilot covered the introduction of Telehealth over the period 2009 to 2010. No such service previously existed for the managing of COPD patients and a 78% reduction in hospital admissions was observed.

As Remote Patient Monitoring has been long established for COPD patients and the total project length was approximately 4.5 months it was deemed unlikely that any significant reduction in hospital admissions would be observed. However, as some patients were already experienced telehealth users of the Docobo Careportal, a key aspect of the study was to capture their assessment of the new 5G Tablet version with the additional video capability and the benefits that this may bring.

Remote Patient Monitoring Technology is new to the two Care Homes in the project, Little Sisters of the Poor Care Home and Alt-Na-Craig House Care Home so additional perspectives were thought to be able to be captured including lessons learned during deployment.

Adoption of the technology by the Alt-Na-Craig Care Home has been slower than in the Little Sisters of the Poor due to an outbreak of COVID 19 delaying the device installation and staff training programme at the outset of the project. However, both Care Home Managements are excited about the potential of the technology.

Watch the Docobo case study video.

Result Summary

The overall result of the I-FIVE project is that among both the COPD Community Patient Group, Care Home Patient Groups and Care Staff there is a high level of acceptance of the 5G connected video-enhanced Remote Patient Monitoring Technology supporting their Care thus demonstrating the benefit of the 5G supported technology in respect of "Keeping people safe, well, and socially connected" in their homes and communities, one of the underlying themes of the 5G Innovation Fund

This is a positive indicator for the Sustainability of the I-FIVE project after completion and Inverclyde HSCP have already indicated their intention to carry on with the use of the system and expand its use to address other Care Homes and Care Homes in the Inverclyde Area and beyond thus "Driving economic growth across the Glasgow City Region" another of the underlying themes of the of the 5G Innovation Fund.

Introduction Context and Rationale

Inverclyde faces significant health challenges due to high levels of deprivation and an aging population. Chronic conditions such as COPD, heart disease, and diabetes are prevalent, placing immense pressure on healthcare services. Limited access to in-person GP and hospital appointments exacerbates these issues, leading to delayed care and poorer outcomes.

The I-FIVE project addressed these challenges by implementing advanced remote monitoring technology powered by 5G connectivity, enhancing care delivery and empowering patients to manage their health. The project also rolled out remote monitoring to two care homes in the Inverclyde area to enable care home staff to monitor residents. Docobo remote monitoring is used in many care homes across England, where it is proven to reduce A&E call outs to care homes, upskills, and empowers care home staff and enhances care for residents.

Project Objectives

The project aimed to achieve several key objectives to enhance care delivery and patient experience. These were:

- Deploying remote monitoring to patients and residents at two care homes using 5G-enabled tablets devices upon which the DocoboApp has been installed.
- Deploying 20 5G-enabled tablets to patients and 4 tablets to two care homes, supporting 80-120 residents upon which the DocoboApp has been installed.
- Enabling proactive detection of health deterioration through regular monitoring and video consultations.
- Reducing unnecessary ambulance callouts, A&E visits, and GP appointments.
- Improving patient empowerment through the provision of self-management tools and educational resources.
- Demonstrating the scalability of 5G-enabled healthcare solutions across the Glasgow region.
- Enhancing remote monitoring with video consultations and educational content.
- Improving clinical triage efficiency and reducing face-to-face consultations.
- Gathering data on 5G connectivity performance and its impact on patient care.
- Aligning with Glasgow City Region's goals of improving healthcare accessibility and reducing inequalities.
- Supporting the Scottish Government's vision of a digitally enabled healthcare system and the NHS's net-zero objectives.



Background Statistics / Supporting Data

Problem Statement

Inverclyde has the highest deprivation levels in Scotland, with life expectancy significantly below the national average. Chronic illness prevalence is 15-65% above the national average, affecting the quality of life and increasing healthcare demand. 25% of Inverclyde's population is aged 65+, a figure projected to rise by 38% by 2050.

Approach

The project team worked together to:

- Install twenty 5G enabled tablets into patients' homes and four 5G tablets into two care homes -Little Sisters of the Poor and Alt-Na-Craig House -supporting 120 residents in total.
- Provide project management, stakeholder engagement and training to HSPC clinical teams and nursing home staff.
- Provide the DOC@HOME platform to allow collection of data and provision of video conferencing and high bandwidth download of educational videos and self help.
- Supply 5G Cellular Modem devices to care homes whose building structure may cause signal penetration issues for 5G frequencies to enhance inbuilding connectivity and test suitability.

Data collected will be vital signs (blood pressure, oxygen, etc.) and symptoms (breathlessness, etc.), which are then presented to clinical teams via a clinical dashboard, and alerts generated when readings fall outside the threshold, indicating potential deterioration in a patient's health.

Measuring Objectives

To measure the impact of the project in respect A&E visits, ambulance callouts and GP appointments, we used data from the 2010 Inverclyde telehealth case study to inform our approach. The original 2010 study focused on using a phone-based hub for follow-ups with patients, whereas the current system provides integrated video communication it will serve as a useful baseline for comparison.

The original 2010 case study for the first Pilot covered the introduction of Telehealth over the period 2009 to 2010 where no such service previously existed for the managing of COPD patients and a notable reduction of 78% in hospital admissions was observed.

Remote Patient Monitoring has been long established for COPD patients in Inverclyde and the total I-FIVE project length was approximately 4.5 months and so it was deemed unlikely that any significant reduction in hospital admissions would be observed over this period as some patients were already experienced telehealth users of the current Docobo device which does not have 5G capability so a key aspect of the study was to capture their assessment of the new 5G Tablet version with the additional video capability and any benefits that this may bring in comparison to the current device.

As stated previously Docobo remote monitoring is used in many care homes across England, where it is proven to reduce A&E call outs to care homes, upskills, and empowers care home staff and enhances care for residents.

However the concept of Remote Patient Monitoring is new to the two Care Homes participating in the project as is the introduction of the 5G technology supporting video calling capability, to the Docobo Care Home product portfolio which will allow for a more comprehensive patient follow-up process so additional useability perspectives were thought to be able to be captured including real-world lessons learned during deployment of the devices in the Care Home buildings.

This coupled with new features tailored for the two care homes in the project was anticipated to reduce unplanned in-person clinician, nurse and GP attendance and reduce the frequency of ambulance attendance for emergency admission. The Docobo system enables the Care Home staff to present more information to the ambulance service to determine whether emergency admission is required. This data will provide a foundation for contextualising the improvement goals and tracking progress as the initiative expands.

User feedback from clinicians, carers and patients was captured through questionnaires electronically presented for the patients on their devices.

Docobo Ltd are providing the DOC@HOME remote monitoring platform and the patient-facing DocoboAPP along with supporting hardware (tablets with 5G comms, Blood pressure, SPO2, Temperature) - to monitor patients remotely.

Inverclyde HSCP provide a combination of clinical triage and logistical support, as community nursing colleagues have access to the Docobo clinical portal to review and manage patient data and triage concerns via video consultation. Field technicians will deliver the installations for the patients with the necessary training and support. Inverclyde HSCP are already 'live' using the Docobo system to monitor patients with respiratory conditions in community.

Community Engagement

The project has also offered potential opportunities for engaging additional stakeholders, such as academic or private sector partners in the future to enhance the project's capabilities.

- The project team has already engaged with Vodafone Ltd at both a technical and commercial level as a provider of the 5G Network for the project.
- Subject to positive project outcomes, we will engage with the wider GCR to widen the geographical use of the 5G enabled DOC@HOME platform, and work with Strathclyde University Digital Health teams (under Prof Roma Maquire) with whom Docobo has a longstanding relationship to further develop the capability of the platform into other clinical pathways and its integration with clinical systems such as TrakCare and EMIS.

Collaborative Design

The project team roles are:

Docobo Ltd (a wholly owned subsidiary of Graphnet Health)

Provision of the DOC@HOME Remote Patient Monitoring Platform and the patient facing DocoboAPP, along with supporting hardware (Tablets with 5G comms, Devices for Blood pressure, SPO2, Temperature measurement) to monitor patients remotely. Project management; implementation and training; project reporting.

Inverclyde HSCP

Inverclyde HSCP will provide a combination of clinical triage and logistical support, as community nursing colleagues will have access to the Docobo clinical portal to review and manage patient data and triage concerns via video consultation. Field technicians will deliver the installations for the patients with the necessary training and support. Inverclyde HSCP is already 'live' using the Docobo system to monitor patients with respiratory conditions in community.

Implementation

The implementation was scheduled in three phases:

Phase One (November 2024 to December 2024)

- Deliver equipment and train clinical teams.
 - Develop SOPs, consent forms, and patient information leaflets.
 - Conduct connectivity tests and set up devices.
 - Enrol patients and nursing home residents.
 - ► System Go Live.

Phase 2 (January 2025 to March 2025)

- Monitor patients' vital signs and symptoms via DOC@HOME.
- Conduct virtual consultations and provide selfhelp resources.
- Gather patient-reported outcomes and clinical data.

Phase Three (March 2025)

- Carry out Data Analysis.
- ► Generate Case Study.

Clinical Implementation

For the COPD patients in the community a package of COPD Clinical Questions prepared by Docobo in collaboration with HSCP capturing Vital Sign, Physiological and Symptomatic Data were delivered Daily electronically to the patients through the 5G Tablet Devices which they completed. The answers to which were collected by the DOC@HOME Remote Patient Monitoring Platform and presented to the Clinicians through the Clinicians Portal for assessment. Should alerts be generated because of the received patient data being outside the set limits a Video call was made to check on the status of the patient. Regular status video calls were also made to check the general wellbeing of the patient.

[The benefit perceived by the COPD patients through the implementation of the Technology are highlighted in the Findings Section of this Document]



5G Tablet with DocoboApp for Community COPD Patients



Community COPD Patient Receiving A Video Call



Patient entering clinical data via the DocoboApp through the 5G Tablet

Care Home

Care Home Residents generally individually suffer from a range of Co-Morbidities commensurate with their age and therefore the aim of the Care Home deployment is to maintain the Wellbeing of the patient and where possible improve their quality of life within their own parameters by diagnosing a deterioration of the Residents health status at an early stage and provide early intervention. In the Care Home the Tablet Devices are set up for multi-patient operation with the Virtual Ward Round and "My Resident is Unwell for use by the Care Home Staff to capture the health and symptomatic data from the resident. Should the Care Team identify that the Resident's health has deteriorated they can use the Docobo Application called "My Resident is Unwell" through which the Care Home staff are able carry out a RESTORE 2 assessment and generate a NEWS Score to enable the ambulance service to determine whether emergency admission is required and act accordingly. A Video Call can then take place by the Remote Monitoring Clinical Staff with the carer and resident/patient to determine an immediate intervention.



Care Home Patient entering Clinical Data assisted by Care Staff



Clinician viewing the Patient Data through the DOC@ HOME Clinicians Portal

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Clinicians Portal – NEWS2 Screen



Video Call to Care Home Resident through the Clinicians Portal

[In the Findings Section of this document the full benefits of the technology are illustrated in the real-life case of a Care Home Resident with a Urinary Tract Infection (UTI)]

Implementation Challenges and Experiences

The I-FIVE Project provided some significant technical and practical challenges to implementation which are captured below as useful lessons learned

- Samsung 5G Tablets were found to be Android version 14. The Enterprise version of DocoboApp which is a medical device was then only approved at Android 13. - The internal testing programme was accelerated on the Enterprise version to enable formal release for Android 14.
- Some issues found with the interaction of the Application with the integrated Knox security of the new Samsung Tablets which prevented notifications.
 This required some rapid unforeseen development work to overcome the issue in the short timescale.
- Whitelisting found to be required on HSCP PCs for video server. - This was found to be due to the HSCP smart card security feature.
- Little Sisters of the Poor Care Home had 4G/limited or no 5G coverage – Vodafone kindly carried out a 5G Antenna down-tilt to provide 5G coverage at the building.
- Issues with inbuilding coverage in Care Homes due to building construction – Vodafone Gigacube cellular modems have been purchased for the Care Homes to provide 5G generated Wi-Fi coverage within the care Homes in not-spots and enable the use of existing

Wi-Fi only devices so increasing the benefit of the deployment.

- Variable in-building Wi-Fi penetration particularly in rooms with the door shut for consultation at Little Sisters of the Poor Care Home. The antenna down-tilt applied for the 5G Network provided external coverage and connection to the existing Gigacubes but the building is made of stone causing attenuation of the Wi-Fi signal in some areas - An additional Gigacube to produce greater in-building Wi-Fi coverage density was purchased together with Powerline Wi-Fi extender equipment.
- A Community Patient lived in sheltered accommodation within a 1970s style concrete building with metal reinforcing creating a Faraday cage effect. Whilst a successful 5G video call was made in-building signal level was low. Many such buildings exist in the Inverclyde, Potential RF solutions such as the Radio Dot pico-cell solution are being investigated but would be a building solution rather than an individual user and raises the question as to Who Pays – A further Gigacube has been mooted to see if operation can be improved. The investigation ongoing but not resolved within the timescale of the project.

Evaluation Framework

The impact of the project was evaluated both quantitively and qualitatively as follows:

Docobo and Inverclyde HSCP partnership working aimed to evidence both qualitive and quantitative positive measures in the expected outcomes:

- 1. Improved clinical capacity and assessment Regular readings from patients allow clinicians to filter and prioritise patients. With access to video consultation, clinicians are enabled to deliver improved clinical triage, resulting in greater access and more connectiveness. The ability to triage in such a dynamic and response was anticipated to reduce the volume of routine and unnecessary face to face patient visits. The regular monitoring supports the progress from reactive to initiative-taking preventative care. In addition, the project aimed to measure quantitative changes in A&E, unplanned admissions and GP same day appointments.
- Questionnaires were distributed on conclusion of the project to capture the Clinicians experiences of the system and the perceived benefits.
- 2. Improved Patient care and empowerment Remote monitoring allows patients to take more ownership of their condition. With the ability to take physiological readings and track the progress of their health condition coupled with professional clinical advice via DocoboAPP, we anticipated that the right frequency of engagement between the patient and

the service will increase both patient care and patient empowerment.

- Quality of Life PROM's and PREM's were distributed ► electronically via the 5G tablet through the DocoboApp to measure the experiences of the Patients and perceived benefits presented directly to the Community Patients and via the Care Home Staff to the Residents.
- 3. Reduced Carbon Emissions The project was expected to produce a reduction in face-to-face unplanned visits from clinicians, which in turn will create less travel thus supports the NHS net zero objectives.
- Anecdotal evidence was captured from the Community ► Nurses through interviews captured on video.
- 4. Digital inclusion providing technology and connectivity with the appropriate support and education to people that may otherwise be isolated and excluded from patient access.
- The benefits for the Community patients were captured via appropriate PREMs delivered electronically via the 5G tablet through the Docobo App.

Quantitative Measures Summary

- Reduction in A&E visits, ambulance callouts, and GP appointments.
- Connectivity, reliability, and stability of 5G devices.

Qualitative Measures Summary

- Patient and clinician satisfaction (measured via PROMs and PREMs).
- Improved patient satisfaction and confidence in managing their condition.

Patient satisfaction

Patient satisfaction was a key focus of the project, alongside the goal of reducing GP visits. For example, if patients appreciate video calls, this feedback will be captured to inform future improvements. In care homes, the ability to monitor all patients and address issues proactively is critical. The "My Resident is Unwell "Care Home Application enables the Carer to automatically carry out a RESTORE2 Assessment and generate the patients' NEWS score. If this is poor, care homes can escalate to the ambulance services, and the NEWS score is reassessed upon ambulance arrival. The system developed in the I-FIVE Project facilitated an integrated care approach between HSCP Clinicians remotely managing the patients, the care staff in the care home and ambulance and GP services, ensuring seamless communication and response.

beyond the I-FIVE project end date demonstrating the sustainability of the concept with the potential to gain the involvement of other HSCPs in expanding the project further and addressing other care homes in the region after a successful completion of the project. See the Sustainability Plan Section for more details.

Findings

The addition of tablets and integrated clinician to patient 5G video calling represents a significant advancement over the previous phone-based hub model, enabling more effective follow-ups and care in the community.

Community COPD Patients

The introduction of Telehealth into Inverclyde, where no such service existed previously in 2009 achieved a notable reduction of 78% in Hospital Admissions from the Community. Telehealth is now the norm so the introduction of the 5G technology into the community particularly in view of the short project timescales has so far not bought about any further reductions but has brought about benefits in terms of enhanced care.

A Questionnaire was scheduled to be delivered to Community COPD Patients electronically through the device at various points in the study.

22 Responses have been received as shown in the Figure below.

COPD – Patients@Home

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• 22 Responses (05/03/2025)

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- 22 responses (V0/V3/vava) Did you enjoy using Remote Monitoring ? & Moderately, 12- Very, 2- Extremely Do you feel the mumber of times you have seen your GP /Nurse Practitioner/Practice Nurse/Specialist Nurse has reduced sin Monitoring ?11 No, 1 Not applicable, 3- Ves but not because of Remote Monitoring , 7 Ves, because of Remote Monitorin
- Do you feel you have reduced the number of visits you have made to Hospital since you have been using Remote Monitoring -?No, 1 Not applicable, 4-Yes but not because of Remote Monitoring, 11 Yes, because of Remote Monitoring aged since you have been using Remote Monitoring 2-8No, 2 - Yes but not because of Remote Monitor ø
 - Do you feel your condition has been better 14 Yes, because of Remote Monitoring
- O Do you feel your health has improved since you have been using Remote Monitoring ? 1/1No, 2 Yes but not because of Remote Monitoring, 9 Yes, because of Remote Monitoring -Do you now feel more able to manage your health conditionso as to reduce your need to see a doctor or nurse ? 5- not at all, 7 – Slightly, 5 – Moderately, 5 – Very
- very Has Remote Monitoring reduced anxiety regarding your condition 7.4Not at all, 6–Slightly, 7–Moderately, 5-Very Have the people around you, cares or family, benefitted from Remote Monitoring 7-Mot at all, 3–Slightly, 3–Moderately, 9-Very, 3-Extremely How likely would you be to recommend this service to your family and friends. (if they were in a similar situation)? Bot at all, 10–Very, 10–Extremely
- Were have by the provide the sector of th
- Has Remote Monitoring helped you become more confident to manage your own health 7-9No, 17 Ye
- Have you made any changes to your lifestyle as a result of using Remote Monitoring ? 19- No, 3 Yes

The results are presented below in graphical format.



HSCP is committed to continue with the service



No Not applicable Yes, but not b

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Community COPD Results Summary

The results show high level of acceptance of the Remote Monitoring Technology.

21 of 22 respondents said yes to the Question "Would you consider using Remote Monitoring to support your health needs in the future?"

17 of 22 respondents said Yes and 5 said No to the question "Has Remote Monitoring helped you become more confident to manage your own health?"

This is a positive indicator for the Sustainability of the Project after completion. Further data will be gathered as part as Business as Usual to maintain Patient Satisfaction.





using Remote Monitoring in the future

say Remote Monitoring has helped them to become more confident managing their health

Care Home Patients

For the Care Home setting, this initiative represents a new area of innovation in Inverclyde, with no prior non 5G Telehealth benchmarks to build upon. Baseline Data has so far been obtained from Little Sisters of the Poor for the A&E and unplanned hospital and GP and other clinician visits for the past 6 months but the Care Staff and Patents are still in the familiarization stage so a pattern has not yet been established within the timescales of the project

which supports approximately 120 patients across two care homes, allowing patients to receive care at home whenever possible.

Three Care Patients partially responded to the questionnaire and example from 1 patient is shown in the figure below and it is recognized that the applicability of some of the omitted questions may depend upon whether the Patient is entering his own data in the Care Home or is being helped by a Carer.

However, it was important to have a common questionnaire for both the Community and Care Home patients for consistency.

Care Home

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- 1 Response Partial (05/03/2025)
- Do you feel the number of times you have seen your GP/Nurse Practitioner/Practice Nurse/Specialist Nurse has have been using Remote Monitoring? Not applicable
- Do you feel you have reduced the number of visits you have made to Hospital since you have been using Remote Monitoring? Not applicable
- Do you feel your condition has been better managed since you have been using Remote Monitoring? Yes, because of Remote Monitoring
- Do you feel your health has improved since you have been using Remote Monitoring? No
- Do you now feel mean manufactures ance you have been using renotee monitoring in or Do you now feel more able to manage your health condition so as to reduce your need to see a doc Has Remote Monitoring reduced anxiety regarding your condition ? Not answered Have the people around you, carers or family, benefitted from Remote Monitoring? Not answered ed to see a doctor or nurse? Not ar
- How likely would you be to recommend this service to your family and friends (if they were in a similar situation)? Not answeed
- How long have you been using Remote Monitoring? Less than 1 month Was using the Remote Monitoring equipment easy? Not answered

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- Would you consider using Remote Monitoring to support your health needs in the future? Not ans
- Has Remote Monitoring helped you become more confident to manage your own health? Ye Have you made any changes to your lifestyle as a result of using Remote Monitoring? No

Whilst the majority the questions have not been answered with the Patient having been using Telehealth for just a few weeks Yes answers for the following Questions give positive indications for the future use of the technology.

"Do you feel your condition has been better managed since you have been using Remote Monitoring? Yes, because of Remote Monitoring"

"Has Remote Monitoring helped you become more confident to manage your own health? Yes"

Carer Feedback

One Carer has so far completed the Care Staff Questionnaire with incredibly positive feedback. Regular Satisfaction Surveys for both Patients, Carers and Clinicians becomes Business as usual in the ongoing deployment.

Carer Feedback

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- 1 Response (31/03/2025) How long have you been using Remote Monitoring in your care home? Less than 3 months
- Do you feel your residents conditions have been better managed since you have been using Ren Monitoring? Yes, because of Remote Monitoring
- Do you feel the number of times your resident has seen your GP/Nurse Practitioner/Practice Nurse/Specialist Nurse has reduced since you have been using Remote Monitoring? Yes, because of Remote Monitoring
- O Do you feel you have reduced the number of visits your resident has made to Hospital since you have been using Remote Monitoring? Not Applicable O pou feel that remote monitoring has helped to increase support for your residents health & care needs? Extremely
- - O How likely would you be to recommend this service to other care/nursing homes? Extremely
 - Was using the Remote Monitoring equipment easy? Extremely
 - Have features that Remote Monitoring enable been beneficial in residents care (e.g. video calling, picture messaging, information access, better communication) ? Extremely
 - Has connectivity for your Remote Monitoring devices been good or (if sim cards or 5G routers have been used) better than existing wifi ? Very
 - How much did you enjoy using Remote Monitoring? Extremely

All the answers were answered very positively but the answers to these questions give positive indications for the future use of the technology

"Do you feel the number of times your resident has seen your GP/Nurse Practitioner/Practice Nurse/Specialist Nurse has reduced since you have been using Remote Monitoring? **Yes, because of Remote Monitoring**"

"Do you feel that remote monitoring has helped to increase support for your residents' health & care needs? *Extremely*"

"How likely would you be to recommend this service to other care/nursing homes? **Extremely**"

"Have features that Remote Monitoring enable been beneficial in residents care (e.g. video calling, picture messaging, information access, better communication)? *Extremely*"

"Has connectivity for your Remote Monitoring devices been good or (if sim cards or 5G routers have been used) better than existing Wi-Fi? **Very** "

"How much did you enjoy using Remote Monitoring? Extremely"

Clinician Feedback

Four clinicians were interviewed and completed a feedback survey on the system. The analysis of the responses is shown below together with free form comments.

Clinician Feedback





Clinician Feedback





Clinician Feedback

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Clinician Feedback





Clinician Feedback

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Of the four clinicians one was less familiar with the operation of the system and had not use it for triage and only moderately enjoyed using it whereas the other 3 Clinicians became enthusiastic users and saw the value and the benefits it can offer them to assist in the care of their patients.

The free form comments highlighted the excellent relationship between Docobo and Inverclyde HSCP throughout the I-FIVE Project built on many years of working with each other which has been essential in delivering the project in a brief period of time.



Anecdotal feedback — The "Stories"

During creation of the Video Case Study several interviews of Clinicians Care Home Staff and Patients and some anecdotal feedback and stories were captured. Some examples of these are below.

Patient at Home – Luigi Marturando:

"It's certainly very much of a help. Apart from the state of mind for myself, it is also for my family, for those around me. They know that it is not just them that check on me because sometimes they call my wife. The kids, is daddy, okay? is Grandpa, okay? And yeah, they don't worry about it. Now they know apart from that, that it has been checked all over.

Other illnesses should be monitored in similar fashion as well because it is a direct contact between the patient and the doctors. Those in the middle are the Docobo people, which stop the patients who are pestering with the doctors, or the ones which are the opposite, that don't want to bother anyone. The Docobo people are right in between. So, it's something that I would recommend to everyone no matter what."

Alt-Na-Craig House Care Home – Deputy Manager – Catherine McIntosh:

"We're excited for the opportunity to use Docobo. To improve the care received by our residents. The use of Restore2, the virtual ward rounds and the video conferencing calls. We're looking forward to using that to reduce the time that every resident needs to wait for the care that they receive, whether it be that they need antibiotics prescribed or whether they need to be seen by a clinician."

Little Sisters of the Poor Care Home – Clinical Lead – Cristina Minda:

"We did have a resident with a chest infection. Usually, the protocol is you do your observations in the morning, then eight o'clock you are on the phone with the GP, and you usually wait around half an hour, an hour to get through the receptionist. Then the receptionist will pass to the GP who can take around five, six hours to come in. Then for the GP to come leave us a prescription for us to send it to Boots to the pharmacist, to then being delivered to the home. So, it does take 10 hours. I would say it can take exceptionally long.

While for this specific resident, we did our observation set in the morning. We went on the Docobo, put the request to the liaison nurse who called in half an hour. It's usually less than two hours when they would respond to an alert. She was able to come in less than two hours, assess the resident and prescribe an antibiotic. We had antibiotic in the building within five hours. The resident did receive the care really fast, and the resident had the

best options to get healthy again.

Another incredibly positive future of the Docobo is the video call. We did have two residents that presented with skin concerns. Instead of once again going through the GP with the same trial to speak with the receptionist and pass over to the GP, we've been able to do a full assessment and sent it through the Docobo system.

Then the liaison nurse contacted us between the two hours timeframe. We have done a video call consultation with the liaison nurse.

She was able straight away to have a look. If she wasn't sure exactly what the presentation of the skin was, we were able to take pictures and send to the liaison nurse and the liaison nurse to relay with the GP at once. We did have an answer within an hour or two, which was amazingly effective. We didn't have to wait for hours and hours for somebody to come out.

I would recommend the Docobo system for all the nursing homes in Scotland firstly, because it gives you an easier access to care for our resident. You can get care in a timely manner. You don't need to spend your time on the telephone, especially in the mornings when it is extremely busy. All nursing staff including night shift can utilize the Docobo system without having that full diary in the morning to make calls.

It is very straightforward and so it does give you more time for the residents to give direct care than spending on phones.

And I will say from a deputy perspective, it does give me an incredibly good insight on what is happening clinically with my residents and what my staff are doing and what steps they are taking.

I can monthly review how many GP calls were out, how many or if we did require any urgent care as well. And with the Docobo system, I can clearly see if there is a decline in the president's health as well.

Having the Docobo system, it means that I don't need to do the frailty score anymore because I have it as data on Docobo.

I don't need to use the Restore2 tool in a paper form because it is already on the system.

I don't need to do the resident of the day on paper form because I have it on the Docobo system.

So, it does cut my time on paperwork because everything is in one system.

Then at the end of the month I can just request a report from the system.

The system is doing this for me so I have all the information in a format that I can utilize, can inspect, I can utilize it for me to oversee the clinical needs. It helps me as well to see what training needs, I may have for the

nurses.

One thing that we haven't specified is that we could document if somebody had a fall, we can document how many UTIs a person has. So, it does give me information that if somebody has many UTIs, it does bring attention to me why... So, with Docobo, I can have the information in hand.

So overall, the Docobo system is extremely beneficial.

When we are requesting care out with the home, we can print a day report to send to hospital or we can print this for the GP when they come to assess residents. It does give a full overview. It does help me with overseeing the clinical need of our residents and as well, it does help with quality assurance, which is extremely important for our Ward yearly inspections."

James Gallagher – Senior Carer – Little Sisters of the Poor:

"One of our residents was displaying symptoms of a UTI so when we picked that from the drop-down list, we then get questions, what are they displaying? What are the symptoms? You're filling out a lot of information based on how that resident is reacting to what you initially think it is. That information then will go straight to the district nurses who will get back to you in an agreed timeframe which is usually two hours. So, with the UTI we got a phone call, and we explained some of the same answers again on Docobo and from that the district nurses were able to prescribe an antibiotic which were able to get that day which saved a lot of distress for our resident. If we didn't have that system in place what would normally happen is we would phone the GP with the same information who would request a sample first, which would be a day. They would then decide whether they would issue an antibiotic which could be another day. So, you're adding two days of distress to a resident, which could be fixed in two hours with Docobo."

All these stories paint a positive picture of the benefits of the system to patient, carer, and clinician particularly the video calling enhanced by 5G and the reduction in the need for an in-person clinician visit thus supporting the NHS net zero objectives.

Reduction in A&E, unplanned admissions and GP same day appointments

One of the original objectives was to determine if there was a reduction in A&E, unplanned hospital admissions and GP Same Day using the system.

Anecdotal and Survey evidence has suggested that this is the case.

A notable reduction of 78% in hospital admissions was observed with the introduction of Telehealth in the original Case Study carried out in 2009 to 2010. However Remote Patient Monitoring has been long established since then for COPD patients in Inverclyde and as the total I-FIVE project length was approximately 4.5 months it was deemed unlikely that any significant reduction in hospital admissions would be observed over this period for the Community COPD Patients as some patients were already experienced telehealth users of the current Docobo device which does not have 5G capability so for them the key aspect of the study was to capture their assessment of the new 5G Tablet version with the additional video capability and any benefits that this may bring in comparison to the current device.

However the concept of Remote Patient Monitoring is new to these two Care Homes participating in the project as was the introduction of the 5G technology supporting video calling capability, to the Docobo Care Home product portfolio which allows for a more comprehensive patient follow-up process so additional useability perspectives were thought to be able to be captured including real-world lessons learned during deployment of the devices in the Care Home buildings.

This coupled with these new features tailored for the two care homes in the project was therefore anticipated to have reduced unplanned in-person clinician, nurse and GP attendance and reduce the frequency of ambulance attendance for emergency admission. This is based on the fact that Docobo Remote Patient Monitoring is used in many hundreds of care homes across many health authorities in England, where it is already proven to reduce A&E call outs to care homes, upskills, and empowers care home staff and enhances care for residents.

The results from Frimley Health and Care across 13 Care Homes, the same number as in the Inverclyde area are shown below and similar results from other health authorities give an indication as to what outcomes can be confidently achieved at the 2 care Homes in the project in the future particularly with the new benefit that the Video Consultation capability supported by the 5G Technology



Baseline Data had only been able to be obtained from Little Sisters of the Poor for the A&E and unplanned hospital and GP and other clinician visits for the past 6 months but the Care Staff and Patients are still in the familiarization stage so a pattern has not been able to be established within the timescales of the project but data will continue to be collected in Business as Usual upon completion of the project.

However, from the Survey and Anecdotal feedback from the Clinician indications are already present that is a Reduction in A&E, unplanned admissions and GP same day appointments.

Key Insights

- The results show an overall high acceptability of the 5G enhanced Remote Patient Monitoring System Technology with great enthusiasm among both Patients and Clinicians in both Care Homes and the Community.
- Video Consultation enhanced by using the 5G Technology has been demonstrated to be of significant value in Patient Care.
- Remote Patient Monitoring has been shown to improve early detection of health deterioration, enabling timely interventions, and bringing reassurance to both the patient and the Carer.
- Video consultations have also been demonstrated to reduce the need for unplanned travel, alleviating stress for patients and carers and supporting the NHS net zero objectives.
- Educational content delivered through the device to COPD patients has been shown to empower patients to manage their conditions more effectively.

Stakeholder Feedback Summary

- The Patients appreciated the convenience of remote monitoring and reported feeling more connected to their care teams.
- The Clinicians valued the efficiency of the triage processes and the ability to focus on high-priority cases.

Key Considerations

Facilitators

- A strong collaboration between healthcare providers and technology partners such as that existing between Docobo and Inverclyde HSCP is key to producing the best results from the implementation of the Technology.
- Proven effectiveness of the DOC@HOME platform and the experience of Docobo working in similar NHS settings gives confidence in the implementation of new Technology.
- Full support from the Care Home Management is essential for a fully successful deployment. Both Care Homes have been enthusiastic about the benefits that the innovative technology will bring them.
- ► In such a 5G cellular based technology project close

cooperation with the network provider, Vodafone in this case was essential to understand the extent of the available coverage and to enhance the coverage where required. Vodafone applied an antenna down tilt to provide 5G coverage for the Little Sisters of the Poor Care Home where coverage was predominantly 4G.

Barriers

Here are the barriers that have been highlighted and addressed:

- HSCP: We require GP Practices to come on board and supporting us to set the parameters for the patients' observations.
- HSCP: Some patients are not suitable when attending the home for screening e.g., Not able to use technology, not wanting to be remotely monitored, circumstances when in patients house which I would deem not suitable.
- Initial digital literacy challenges among some patients and staff.
- Limited time frame for comprehensive data collection and analysis.
- Technical challenges with 5G connectivity particularly in-building coverage when operating in the higher n78 band were anticipated at the outset given the type of construction of many of the buildings in the area.
- Patient resistance to adopting the innovative technology.

Mitigation strategies

- Training will be provided on the simplified, lockeddown devices to address digital literacy challenges. There will also be the option for patients to use their own devices if preferred. For COPD patients, the specific device type is less important; the focus is on enhancing the patient experience and ensuring patients have access to the tools needed for effective care.
- A 5G Base Station Antenna was down-tilted by Vodafone to mitigate poor 5G coverage in one of the Care Homes.
- Cellular Modem technology was used in the Care Homes to mitigate in-building signal attenuation by providing an alternative Wi-Fi signal generated by the cellular modem device.

Learnings

- Combining 5G technology with established remote monitoring solutions enhances healthcare delivery.
- Regular feedback loops are essential for refining user experiences and improving adoption rates.

Conclusion

The I-FIVE project successfully demonstrated the power of 5G-enabled remote patient monitoring, and how it can address healthcare inequalities, improve patient outcomes, and reduce demand on overstretched services. By integrating advanced technology with patient-centric care, the initiative aligns with regional and national healthcare priorities and provides a replicable model for other areas.

Next Steps

- ► Expand the use of 5G-enabled DOC@HOME across the Glasgow region and other clinical pathways.
- Collaborate with academic institutions to further develop the platform's capabilities.
- Explore additional funding opportunities to sustain and scale up the project.

Sustainability Plan

Inverclyde HSCP's proven commitment to sustaining remote monitoring services ensures long-term viability. Data from this project will support funding applications and strategic planning for wider implementation. Partnerships with academic institutions and other health boards will drive innovation and scalability, ensuring ongoing benefits for patients and healthcare providers.

In the longer term, the team will work on a cost-benefit analysis to demonstrate the financial viability of scaling the initiative.

Inverclyde HSCP has funded and sustained their current COPD service for over 10 years, so have a proven commitment to sustain new services developed that are proven to show positive benefits to both service users and the public sector. They are committed to support, sustain, and grow the innovative ways of working and connecting with their clients that the outcomes from this project will highlight.

With the positive outcomes and the new innovative services that this funding has achieve, Inverclyde have secured the additional ongoing FY25/26 funding to support this patient population from the end of the project, and potentially beyond this utilising the equipment purchased for this project to continue to provide the benefits to their case load.

Given the positive outcomes, Docobo will engage with the wider Glasgow City Region (GCR) to widen the geographical use of the 5G enabled DOC@HOME platform and further develop the capability of the platform into other clinical pathways starting with Heart failure and its integration with clinical systems such as TrakCare and EMIS. Docobo has been supplying remote monitoring solutions into Inverclyde for over 10 years, so proven to be committed to supporting Inverclyde and the wider economy.

Overall Result

The overall result of the I-FIVE project is that among both the COPD Community Patient Group, Care Home Patient Groups and Care Staff there is a high level of acceptance of the 5G connected video-enhanced Remote Patient Monitoring Technology supporting their Care thus demonstrating the benefit of the 5G supported technology in respect of "Keeping people safe, well, and socially connected" in their homes and communities, one of the underlying themes of the 5G Innovation Fund.

Following the completion of the project, Inverclyde HSCP have already secured the additional funding required for FY25/26 for the use of the Docobo 5G enabled DOC@ HOME Remote Patient Monitoring platform for the continuing care of the participating patients in both the Community and Care Homes.

This is a positive indicator for the long-term Sustainability of the I-FIVE project.

Inverclyde HSCP and Docobo also aim to expand the I-FIVE project initiative into other Care Homes in the Inverclyde Area and beyond, thus "Driving economic growth across the Glasgow City Region by supporting the adoption of advanced wireless technologies in Health and Social care" another of the underlying themes of the of the 5G Innovation Fund.

The I-FIVE project successfully demonstrated both the value and the future potential of 5G-enabled Remote Patient Monitoring in a real-world deployment for improving patient outcomes in both the Community and in Care Homes.

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Find out more about the project on the Glasgow City Region website.

Disclaimer

The findings presented in this case study reflect the independence of the project and the collaborative efforts of all stakeholders. No conflicts of interest have been identified.