1 Highland Pre-hospital Immediate Care and Trauma (PICT) team - 2021

2 Background

- Scottish Government has instructed territorial health boards to integrate their major trauma care into both a national and four regional 'Trauma Networks'. These carry key performance indicators set for the care of major trauma in the prehospital, hospital and rehabilitation phases. Across Scotland, new funding was allocated for the provision of prehospital enhanced care resources such as the retrieval teams based in Glasgow and Aberdeen and ED based teams in Edinburgh and Dundee and for the BASICs clinicians providing voluntary enhanced responses across rural Scotland. Following the choice to site such a team in Aberdeen it was recognised this left the majority of the population of NHS Highland without timely access to enhanced trauma care and agreement was reached between the North of Scotland Trauma Network participating Health Boards and the Scottish Ambulance Service that an enhanced trauma care resource, the PICT team sited in Inverness at Raigmore Hospital, would be developed to better address this equity of access gap.

  This team had already been in existence with NHS Highland funding only until that point. The Trauma Network funding now comprises the majority of its funding. The team was approached by the Scottish Ambulance Service as a site to train and deploy a branch of its critical care paramedic program, itself also integrated into the Scottish Governments national Trauma Network program, and likewise targeting the same KPIs of enhanced trauma care cover for the majority of the highland population.

  The MOU between SAS and NHSH describes all training and clinical governance of PICT APs when on shift with the medic or in clinical contact in the hospital. The model agreed for achieving safe progression of the AP in critical care role requires extensive training and clinical exposure to unwell patients, prior to deployment of interventions such as procedural sedation, regional anaesthetic blocks and surgical access of thorax and neck. As part of their bespoke training program they have extensive access to hospital placements, individual mentoring from consultants, case review and regular teaching sessions, and one to one on job learning and drilling with the PICT medics. As the PICT response team role is best described as 'ED outreach' the curriculum for the critical care APs follows an ED Syndromes approach, akin to the RCEM curriculum for Emergency medicine practitioners, with regular case and procedure exposure to the c.100 emergency patients a day presenting to Raigmore Trauma Unit. The critical care APs also have the direct access to the well governed Decision Support Team line maintained for the past five years by the PICT team senior clinicians.

- For best use of resource, and responsive to the unique challenges of the rural population and health care workforce, the PICT team provides not only immediate response to major trauma cases, but also the site medical team to any local major incident (whether medical or trauma related – note recent bus crashes and regular multi car RTCs), the advanced '3RU' response for cardiac arrests deploying mechanical CPR device when indicated, paediatric medical emergencies and many situations where a 999 call can be dealt with via alternate pathways to ED attendance not otherwise possible if dealt with by regular SAS response, where nationally 80% of encounters result in conveyance to ED.

- For best use of funding and local geography, the team deploys in a rapid response vehicle, based at Raigmore ED. This has resulted in regular effective on scene attendance at Highland emergencies within a 60 mile radius of Inverness, taking in patients who would otherwise be directed to Wick, Fort William or Broadford. The team have also been used as medical escorts to critically unwell patients travelling from an RGH such as Wick to Inverness or from Raigmore to specialist centres in Aberdeen or Edinburgh.

- Scottish government has instructed territorial health boards to wherever possible conduct care in a patient's home and to seek care in the community pathways. The PICT team achieves such integration with assessment of emergency patients often in the home, followed by coordination with GP or OOH services, possible only due to the high level of clinical integration and local knowledge of the team.

- Scottish government has instructed the development of safe, well governed routes of remote senior clinical advice to clinicians where such advice can obviate physical movement of patients to hospital for assessment. The PICT team Decision Support line has been carefully and safely developed to perform this function for both PICT medics and also ambulance crews otherwise planning on conveying their patient to Raigmore ED. Audit shows safe practice and a significant impact on ED avoidance.

- Management of the team sits within the Raigmore Medical Directorate. This predated the Trauma Network funding but as all Raigmore trauma funding has also been managed by the Medical Directorate SM and DGM this has allowed for effective incorporation of all hospital based aspects of the team's functioning and responsibilities. Physician recruitment, standards, equipment, medicines, training, clinical governance, tasking, vehicle and ongoing administration have all been successfully managed over the past 5 years.

  A dual clinician Medic/Advanced Practitioner rapid response team is based at Raigmore Hospital ED, deployable 7 days a week 1100-2300 to best fit the trauma and medical emergency patient presenting times. Doctors who are already trained to the standard of individual 'BASICS' prehospital medics, are given additional training, case review and regular teaching and clinical governance sessions. The majority of these doctors have taken on regular shifts within the 7 day fully staffed response team. Several function only as individual responders from their own locales (eg Dornoch or Drumnadrochit) but maintain the higher

standard of training and governance and tasking availability provided by PICT. Advanced Practitioners in Critical Care from either a paramedic or nursing background provide the other half of the response team on a daily basis and perform all the emergency driving duties. The vehicle and its maintenance and provision, have been fully funded by the Scottish Trauma Network as part of the SAS national critical care AP program. The Standard Operating Procedures of the team are in alignment with national standards and guidelines. Procurement and safety assurance of drugs and equipment and ongoing maintenance of clinical standards and training is performed by a part time Advanced Nurse Practitioner based at Raigmore. Central collection and storage of all patient prehospital records for a shared database and performance audits, rota and pay requirements have all been safely executed over the past 5 years of the service by a part time administration assistant, also based at Raigmore site. A consultant clinical lead for the service maintains standards, clinical governance, recruitment, service design and development and stakeholder engagement with patients and their families, management team, secondary and primary care clinicians, the trauma networks, SAS, BASICS and others.

- Since 2015, the team has developed in step-wise, incremental tests of change with successful business cases building from a 2 day service to a 4 day service to the 7 day service now in place since August 2020.

3 Key benefits

- Audit of the 4 day service and decision support team projects 312 admissions avoided annually by a 7 day service or 2496 bed days saved annually. (See Appendix 5)
- Service safely reduces ED attendances. Projections for 12 month service of up to 5 ambulances a day avoiding the emergency department either via discharge at scene or direct admissions. For normal ambulance response 80% of patients are conveyed direct to the Emergency Department whereas a PICT reponse results in only 33% being conveyed to the ED and 67% being either discharged at scene or being directed to an alternate pathway of care. (See Appendices 2, 4)
- Health economic data from the avoided processing costs of ambulance journeys, ED attendances and hospital admissions alone projects cost savings annually of £1,307,578 for the 7 day service.
- Rigorous governance and patient follow up processes already in place providing reassurance of excellent safety profile for patients avoiding ED or admission. Readmission rates at 7 and 30 days and unanticipated mortality at 7 and 30 days measured and cases examined. (See Appendix 3)
- Safely fulfils requirement for a regularly available enhanced response for the majority of major trauma patients seen in NHS Highland. (See Appendix 1)
- Safely fulfils requirement for a regularly available enhanced response for the majority of major incident events in NHS Highland as per the role descriptor in NHS Highland Major incident Plan April 2021. (See Appendix7)
- Provides maintenance of an already proven service with continuous development and audit since the first NHSH pilot project in 2015.
- Provides SAS and NHSH with **a** flagship service for national strategies such as Major Trauma care, remote decision support, prehospital, secondary care and primary care interface and secures a team that whilst based centrally in Inverness provides emergency care across the majority of the highland population and decision support and training and governance to clinicians from Skye to Brora to Kingussie. The reputational impact has already shown multiple benefits for attracting medical and paramedic recruitment to the region, the hospital and local GP practices.

4 Statutory and regulatory impact

Scottish Trauma Network Report to Scottish Parliament Health and Sport Committee 2021 outlining Scottish Government requirements for the managed clinical network of the STN: *"Co-produce a fully co-ordinated, unique to Scotland, pre-hospital care solution that will make best use of resources and operate under a unified governance framework, to ensure trauma patients access the right level of care as quickly as possible"* *- "Be unique, affordable and fit for purpose. It will provide rapid access to complex treatment, delivered in the most appropriate setting(s) and provide definitive care for our most severely injured patients by ensuring that there are good readily available local, regional and national trauma services."* *- "Enhance existing trauma services by co-producing and delivering an inclusive, equitable trauma network, which will save more lives and improve outcomes for injured people across Scotland."* *- "Deliver the best care possible, through agreed and clearly defined clinical pathways, with appropriate quality assurance and improvement arrangements."*	The PICT team is already established as the most immediately available, affordable and fit for purpose major trauma response to the majority of patients in NHS Highland. Its constituent parts already form the 'unique' and best use of resources model described in the Scottish government directive and the 12 month trial of seven day operations has demonstrated that this service can be safely and affordably extended across the week to provide equity of access for more patients in Highland.

- "Drive improvement in outcomes through the use of good data and create an excellent environment across Scotland for openness, learning, teaching, research and development."	
NHS Scotland LDP standard : *"95% of patients to wait no longer than four hours from arrival to admission, discharge or transfer for A&E treatment. Boards to work towards 98%"*	The PICT team has a demonstrated impact on decreasing ED attendance for 999 call patients both via direct clinical care and remote advice provision. They also perform many of the time consuming emergency interventions prehospitally on those patients who are conveyed to ED. beyond the pilot. This would need to be in place for the end of the current pilot in August 2021.
Health Workforce, Leadership and Service Reform Directorate – Healthcare Waiting Times Improvement Plan ***1. Increase capacity across the system**. More capacity is needed to drive greater improvement. That will require accelerating our current programmes of investment in new capacity as well as putting in place new approaches to get the most out of the existing capacity in the system.* ***2. Increase clinical effectiveness and efficiency**. Improvement must be driven by clear clinical priorities that ensure that we act where the pressures are greatest, whilst recognising that the solutions will be specialty-specific, focused on improving clinical quality, and will be locally driven as well as national in scope. Work will focus both on the needs of particular specialties and clinical areas as well as cross-cutting enablers such as how the workforce can support improvement and the role of new developments in digital technology and innovation.* ***3. Design and implement new models of care**. The improvements in this plan are not limited to single services or localities. They are part of a wider reform of the system of health and care undertaken alongside communities and those who use services to ensure that all our services are focused on improving access to care sustainably and substantially. We need to shift the balance of care quickly and effectively: this means co-ordinated action to change how services in primary and community care and at regional level are designed and delivered.*	The PICT team has demonstrated its ability to reduce the need for hospital admissions and has a well audited safety profile for this achievement.. The ANP role is also crucial for ongoing design and implementation of new models of care, equipment, medicines and techniques within the team.

5 Reputational impact

To date.
The team has built a clinical and organisational reputation for excellence over the past five years, both within and without NHS Highland. It has been held up by the Scottish Ambulance Service, the Chief Medical Officer and the Cabinet Health Secretary at national meetings as an exemplar of intelligent new ways of working being developed that make use of local talent and enhance resilience of existing local resources. *It has demonstrated the ability to fashion a uniquely Highland solution to our geography and healthcare resources in the context of major trauma care and in finding new ways to support emergency care in the out of hours periods and weekends. It has been the greatest single example to the Scottish Government and Scottish Trauma Network of our ability to effectively utilise several hundred thousand pounds of Trauma Network funding in a fashion tailored to our needs and resources.*
Impact on partner agencies
The loss of the service and the care it provides would have knock on requirements for patients being referred to the GP OOH services across the region, BASICS Scotland GPs being asked to attend patients currently attended by PICT and Scottish Ambulance Service would have more patients being conveyed to hospital, thereby using their resources less efficiently and delaying their own response times to emergencies further and require additional resource to fulfil its commitment to providing enhanced trauma care to the region as agreed by the chief execs of the North of Scotland Trauma Network and SAS.

7 List of appendices (if applicable. If not, please delete)

The following appendices are included with this report:

APPENDIX 1 - PICT Major Trauma and enhanced care activity
APPENDIX 2 - Summary of the two audit processes used for the 2021 seven day service business case
APPENDIX 3 – Discharged at scene patient outcomes
APPENDIX 4 – Emergency Department avoidance
APPENDIX 5 – Avoided hospital admissions
APPENDIX 6 – Health economic impact
APPENDIX 7 – NHS Highland strategic Major Incident Plan PICT role descriptor

APPENDIX 1 – PICT Major Trauma and enhanced care activity

During the 12 month audit cycle for the 4 day service 131 RTCs were attended. 71 involved multiple casualties and 17 involved entrapment.

Multiple other major trauma aetiologies were attended including long falls, interpersonal violence and recreational sporting incidents.

A range of enhanced interventions including procedural sedation, nerve blocks, enhanced analgesia and early antibiotic provision were provided to patients on scene as per the break down in Fig 1.

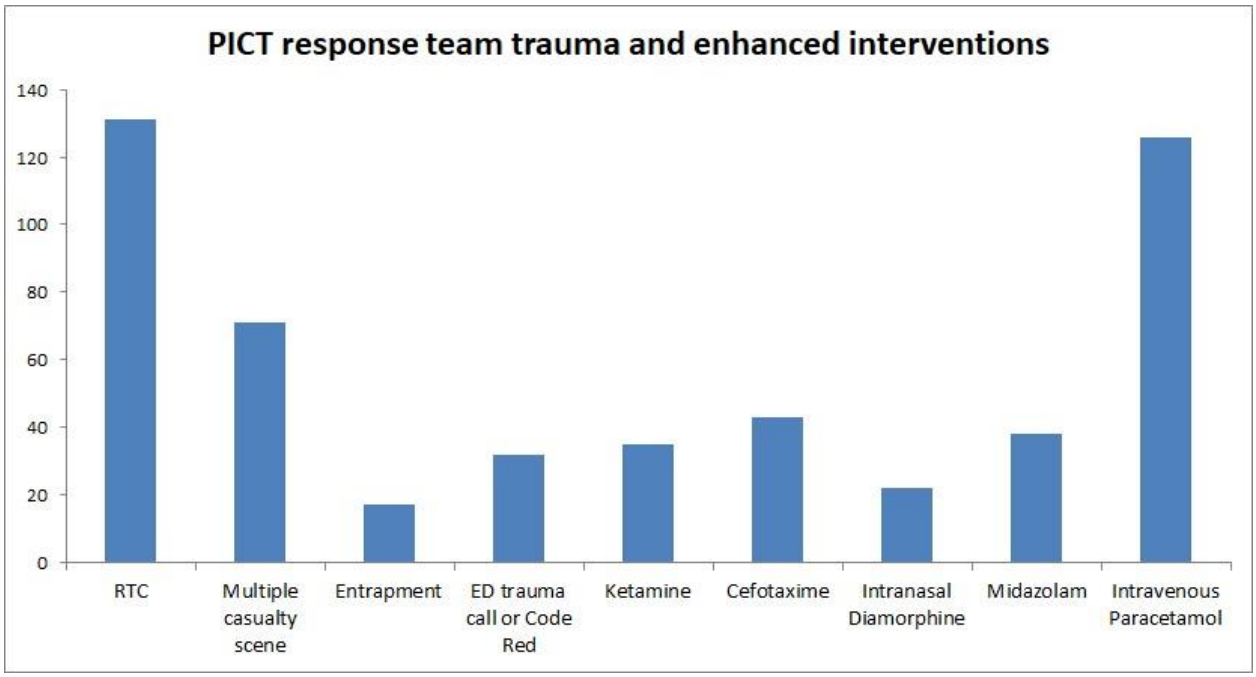

Figure 1 – RTC attendances and enhanced interventions by PICT response team over the 4 day service audit

The quantity and frequency of such advanced trauma interventions is an important feature, but so is the quality or timeliness of these time dependent interventions in our most injured patents.

A focussed audit of Raigmore patients with femoral fractures receiving nerve blocks either from the PICT team or in hospital revealed that highland patients received this crucial intervention on average a full 2 hours and 36 minutes sooner if attended by the PICT team.

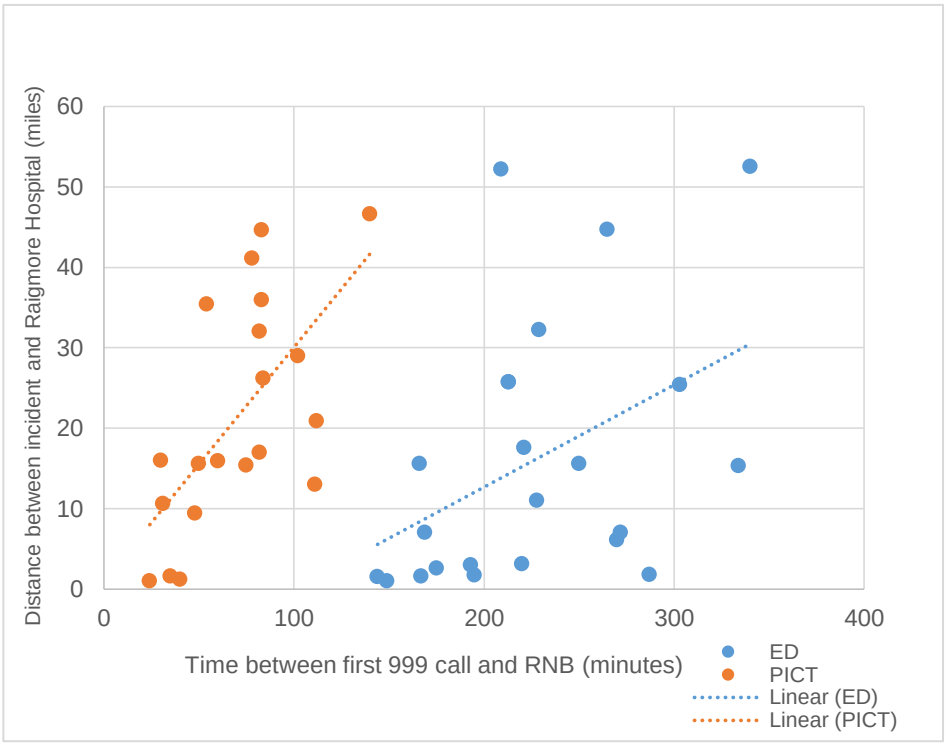

Figure 2 - A scatter graph of the distance between the incident and Raigmore Hospital (miles) (y axis) against the time calculated between 999 call and RNB (minutes) (x axis) for ED and PICT datasets. RNB = Regional Nerve Block

Both ED and PICT datasets show a moderately positive correlation between distance from incident to Raigmore Hospital and time between first 999 call and RNB (ED: p=0.017, r=0.493 (data not normally distributed; Spearman test); PICT: p=0.002, r=0.643 (data normally distributed; Pearson test)).

The time between 999 call and RNB when administered prehospitally by PICT (**mean time 71 minutes**) was considerably quicker than when RNB was administered in ED (**mean time 227 minutes**).

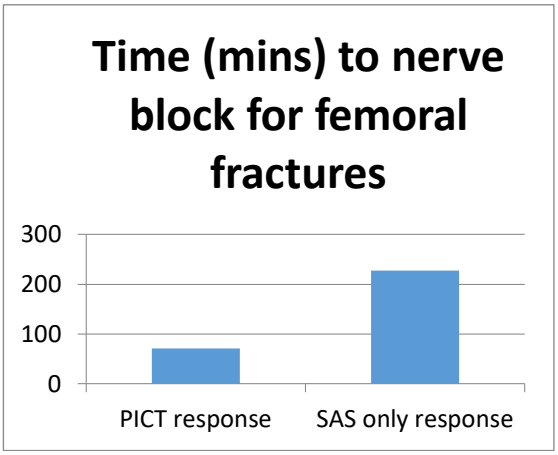

Figure 3 – The time in minutes (mean) for a patient with femoral fracture to receive a nerve block for pain relief

There was found to be no significant difference in the distances between each dataset and therefore this shows that the shorter mean time for PICT is not likely due to PICT attending cases which are geographically closer to Raigmore Hospital. From this it can be concluded that patients with femoral fractures have a shorter wait (**on average 2hr 36 mins sooner**) for effective RNB if it is administered by PICT at scene.

As a service for major trauma and major incident response the geographical reach and timeliness of the team is as crucial as it's enhanced interventions and safe governance procedures. The below map plots the location of Scottish Trauma Audit Group positive (ie major trauma positive) patients received into Raigmore, cared for at scene by the PICT team across the Jan-December period encompassing both 2 day service trial and into the 4 day service trial periods.

Figure 4 – Map of all STAG major trauma patients cared for at scene by PICT response 2019

APPENDIX 2 – summary of the 2 audits used for the 2021 report

4 day service 12 month audit

This was a retrospective audit of callouts made to the PICT response team during the period of 1st of March 2019 until 29th of February 2020 using information taken from the PICT patient report form database. This period represents the first full year of PICT operating as a 4-day service.
Of the 816 patient attendances 22 patients were pronounced dead at scene. Of the 794 patients not deceased at scene 266 patients were discharged at scene (DCAS) , resulting in a discharge rate of 34%. 185 were admitted directly to a ward, bypassing the ED.
Health economic and patient flow projections for the proposed seven day service have been made by taking the annual reported output from the four day service and multiplying by 1.75.

PICT response team Decision Support to SAS 13 week audit

In 2020 between April and July for 13 weeks, the PICT team gave access to its internal dedicated decision support phone line for SAS paramedics. The inclusion criteria was that the default plan for their patient was transfer to Raigmore Hospital Emergency Department. During this period, the response team itself was suspended to allow staff members to be redeployed both within SAS and NHSH for the first wave of covid19 service reconfigurations. This period of decision support only PICT service allows discrete analysis of the impact of this aspect of the service, which has thereafter been maintained in the months following the restart of the response team itself in July.
Advice was given on 295 patients in total, or 23 patients a week, whom SAS paramedics felt unable to discharge at scene or were seeking clinical advice for additional treatments or pathways that decision support might access for them. All would otherwise have been transported to ED with the same likely admission rate of 44% that is the baseline for SAS conveyances ED.
131 patients discharged at scene, with approx 58 avoided admissions as a result. 100 patients were referred and admitted direct from scene to ward, bypassing the ED.
Health economic and patient flow projections have been made by taking the weekly output averages from the 13 weeks of this audit and multiplying by 52
Combining the 12 month projections of the 13 week DST audit and 12 month audit of the 4 day service, reasonable projections can be made for a 7 day service providing both response team and DST service.

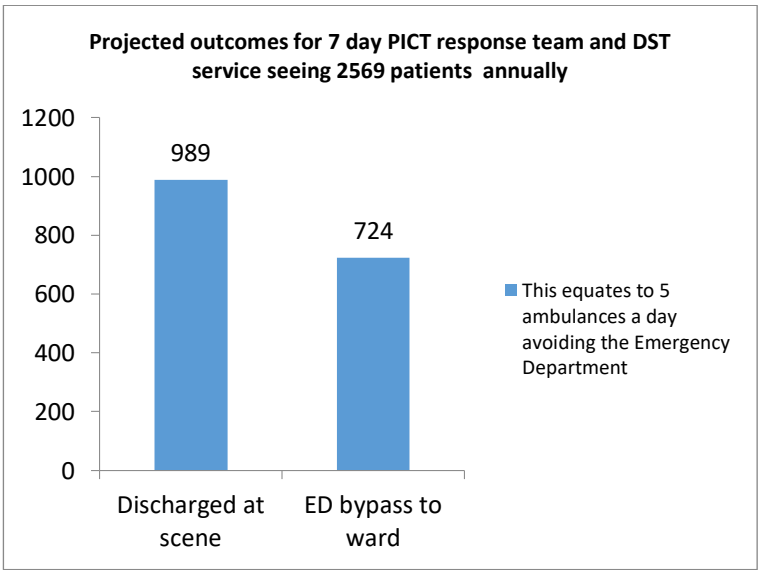

Figure 5 – Calculated totals for a 7 day service for ED avoidance based on both response team and DST service audits

APPENDIX 3 - Discharged at scene patient outcomes

Response team audit

Of the 266 patients DCAS by the response team, 23 (8.6%) were re-admitted within 7 days, and 7 (2.6%) were re-admitted within 30 days.
9 patients who were DCAS died within 30 days, with a mean age of 81.75 years (range 71-92). Of these 9 patients only two were without existing palliative diagnoses giving a rate of 0.7% for unanticipated mortality at 30 days post discharge at scene for PICT. On clinical review neither of these deaths appear relatable to the presenting complaint of the PICT attendance.
Discharged at scene patients who died within 30 days of PICT attendance.

1.In nursing home on paliative care - dehydrated, poor BP
2. Af and over beta blocked. Discussed with DST and GP - commence digoxin in the home
3. Status epilepticus - ongoing seizure until midazolam. Recent letter agreeing palliation.
4. Chest pain - dementia. GTN and fully resolved. Happy to stay in nursing home.
Died 25 days later following investigations for a UTI
5. Hypoglycaemia - palliative care
6. Mobility problems – cancer prognosis less than 6 weeks. GP to arrange suitable emergency cover
7. Cerebrovascular event in frail elderly nursing home resident - end of life care.
8. Muscular back pain – Pain free unless mobile. Died 17 days later from mesenteric ischaemia.
9. Fall, NOF fracture. Recent PE. Advanced dementia. Best interest to stay at home to die with family

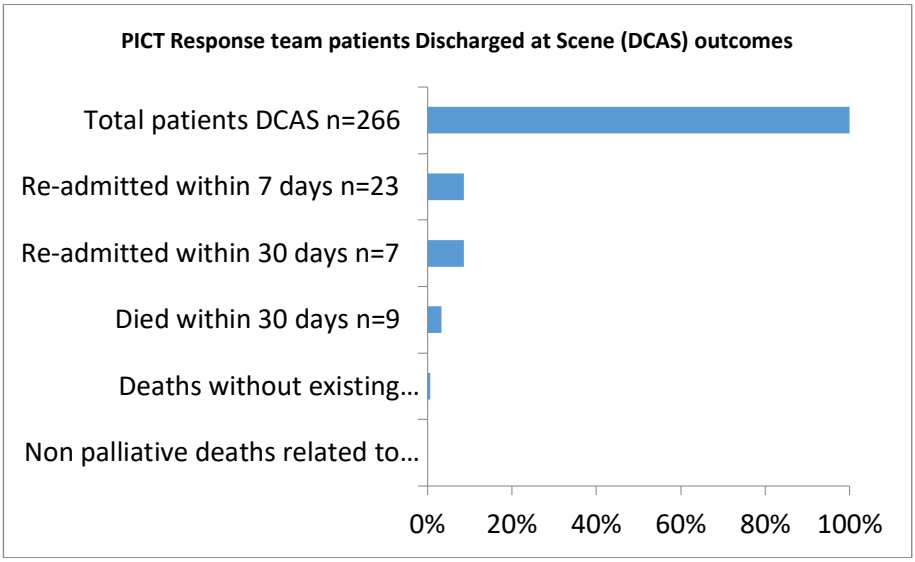

Figure 6 – Outcomes for those patients discharged at scene in the one year 4 day service audit

Decision support audit

Of the 131 patients discharged at scene following decision support, 7 patients (5.3%) re-presented and were admitted within 7 days. None died within 30 days.

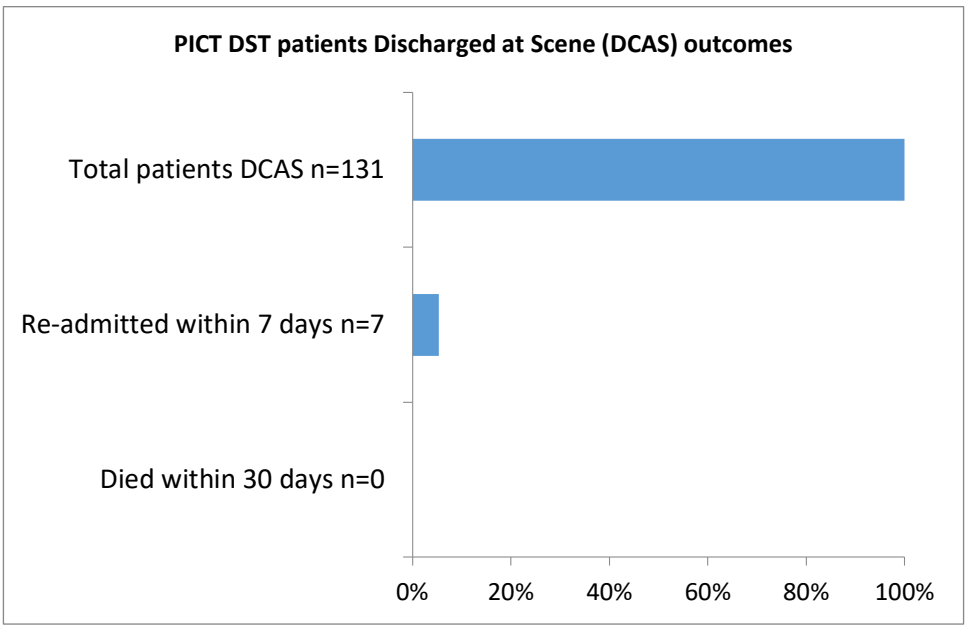

Figure 7 – Outcomes for patients discharged at scene during the 13 week Decision Support audit

4 patients in total of the entire cohort were deceased at 30 days, none of these deaths had been patients who were discharged at scene, all were admitted on the day of advice.

It is worth emphasising the normal SAS conveyance rate to ED for 999 calls is 80%. These patients for whom the decision support service was used were all patients the paramedics had decided they could not themselves discharge at scene. In this context, the dramatically lower conveyance rate to ED of 22% of 999 calls is testament to the value of the training and governance frameworks behind these PICT clinicians, as well as the service being provided by clinicians who are themselves on duty for seeing emergency patients prehospitally or in the ED.

This is the stark difference to other distant advice services seeking to safely offer alternate pathways to 999 patients conveying to the ED. The crucial difference with the PICT service is that the clinicians giving the advice themselves work in the prehospital environment regularly with the response team, have working relationships with ambulance crews and other services, have the ability to go and assess the patient themselves if safer to do so and perform their base roles of seeing patients far more frequently than they provide telephone advice.

These features also inform the reassuring safety profile of this service. The findings of 4/295 (1.3%) mortality for 999 patients receiving this service sits well below international benchmarks ranging between 4%-8% for similar patient cohorts.

APPENDIX 4 - ED Avoidance

As the PICT team are only attending 999 calls for emergency ambulances, the comparator for ED avoidance is the current national SAS 'conveyance rate' to the Emergency Department of 80.7%. This conveyance rate refers to all ambulance attendances, across all acuities and all regions. Of note the average 999 call acuity and distance from hospital in Highland is anecdotally thought to be markedly higher than in more metropolitan regions, resulting in understandably higher actual rates of SAS conveyance in our region.

Of similar note, the PICT team is selectively targeted towards more severe trauma and medical emergencies in order to maximise patient clinical benefit from their enhanced skill set and senior decision-making. Even with this higher average acuity of patient, it is notable that a PICT attendance at scene brings a reduction in conveyance rate and avoids admissions which would otherwise have progressed to both the ED and hospital inpatient stay.

In addition to the 266 patients discharged at scene by the response team, a further 185 patients were redirected to bypass the ED and were instead admitted directly to paediatric, medical or surgical wards. As per a GP or inter-hospital referral this relies on senior decision-maker assessing a patient at scene, potentially stabilising and knowledge of those tests/treatments available in the ED vs wards, as well as the likelihood of ED processes being sufficient for their care pathway or not. The result is a reduction in duplication of work in the hospital phase, and a simpler and invariably more comfortable admission for the emergency patient.

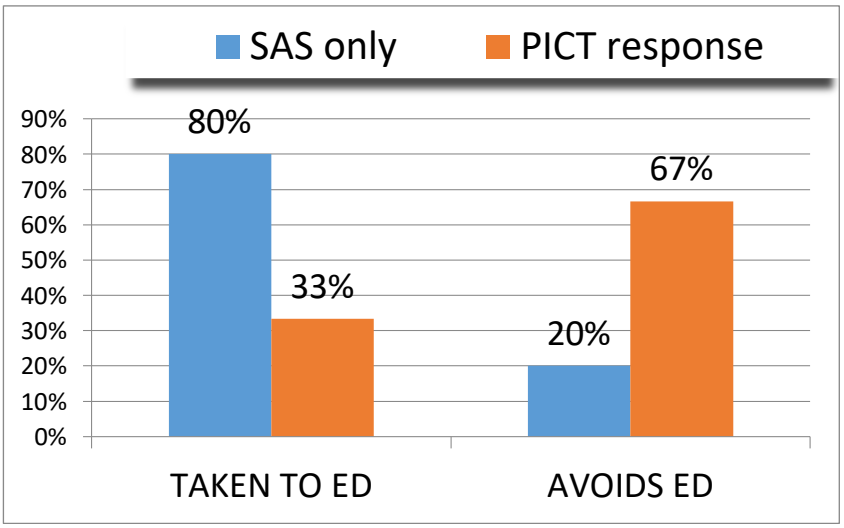

Figure 8 – overall rates of ED attendance across PICT vs normal SAS response

APPENDIX 5 - Avoided hospital admissions

During the 12 month audit cycle of the 4 day service 46 patients avoided admission compared to the regular SAS pathways. Extending this to the 7 day service would project to 80 avoided admissions annually.

During the 13 week audit of the decision support team, 131 patients were discharged at scene with, all of whom would otherwise have been transported to ED with the same likely admission rate of 44% that is the baseline for SAS conveyances ED, meaning 58 avoided admissions over the 13 weeks. Extending this to the 7 day service for a full 12 months would project to 232 total avoided admissions, combining with those from the response team to project 312 avoided admissions annually.

Based on an average length of stay of 8 days for patients admitted to Raigmore (ISD2019), an estimate for bed days saved can be made. A projected estimate of number of bed days saved by PICT in a 7-day service would be **2496 per annum**.

12 month projection for avoided admissions	312 avoided admissions
Mean length of stay for Raigmore Admissions	8 days
Projected bed days saved annually by 7 day service	2496 bed days

APPENDIX 6 – Health Economic Impact

Using data from this audit cycle, and reference costs data, the financial benefit of the PICT team was calculated. The estimated cost savings during this audit cycle, based on the 4-day service are displayed below. Projected savings for a 7-day service were also calculated.

SAS national conveyance rate	80.7% (SAS Annual Report 2019)
PICT conveyance rate	68.1%
Admission rate Raigmore if travelling by ambulance to A&E	44%
Cost per ED attendance at Raigmore	£147 (PHS. Hospital Running Costs By Patient Type 2019)
Cost per SAS conveyance to hospital	£451.64 (PHS. SAS, expenditure and statistics, by region 2019)
Average cost per admitted patient	£2488 (PHS. Hospital Running Costs By Patient Type 2019)
Patients discharged by PICT that would have likely been conveyed to hospital by ambulance	(266 / 31.9(%)) x 19.3(%) = **161 patients** would not have been conveyed by ambulance
	266 – 161 = **105 extra patients** would have been conveyed by ambulance
Number of expected admissions of SAS transferred patients	44(%) x 105 = **46 patients**
Savings on patients that would have been conveyed	(105 x £147) + (105 x £451.64) = **£62,857.20**
Savings on patients that would have been admitted	46 x £2488 = **£114,448**
Savings on patients admitted directly to ward by PICT	185 x £147 = **£27,195**
Total savings by PICT response team	**£204,500.20**
Projected total savings by PICT for 7-day service	**£357,875.35**
Patients discharged by PICT DST over 13 weeks that would have been conveyed to hospital by ambulance	**131 patients**
Number of expected admissions of SAS transferred patients	44(%) x 131 = **58 patients**
Savings on patients that would have been conveyed	(131 x £147) + (131 x £451.64) = **£78,421.84**
Savings on patients that would have been admitted	58 x £2488 = **£144,304**
Savings on patients admitted directly to ward by PICT DST	100 x £147 = **£14,700**
Total savings by PICT DST over 13 week audit	**£237,425.84**
Projected total savings by PICT DST for 7-day service	**£949,703.36**
Combined projected savings for 7-day service PICT response team and PICT DST	**£1,307,578.71**

APPENDIX 7 – PICT MANDATE WITHIN NHSH MAJOR INCIDENT PLAN APRIL 2021

"SITE MEDICAL TEAM - PICT

Pre-hospital Immediate Care & Trauma Scheme (PICT) has developed in recent years and is a multi-disciplinary and multi-seniority service, with clinicians from hospital and community, urban and rural, consultant, GP and Nurse practitioner all participating. In addition to taskings by the National Trauma Desk to individual major trauma cases, PICT members can also be deployed as a Site Medical Team to the scene(s) of a major incident. They are supported by the Decision Support Team, a cadre of senior consultants who are available 24/7 to provide guidance and advice to PICT members, and through whom the PICT Team would be deployed as the Site Medical Team following notification/request for their services via the Ambulance Control Centre."