Supplementary file 2: Interview verbatim quotes and observation notes to support qualitative findings

i-PARIHS construct	**Key findings**	**Exemplar Data**
Facilitation (Internal)	Robust planning Defining project team roles improves early adoption of bundle	**HASU 1:** (evidenced from action logs) • Convened an internal facilitation team (consisting of a stroke consultant, nurse ward manager and stroke specialist nurse who was responsible for data collection) from January 2017. • Held regular internal facilitation team meetings (7 prior to bundle launch). • Action logs demonstrate how the team identified a list of actions required ahead of bundle launch and assigned which project team member was responsible for each action **Interview 1, Project lead 1, HASU 1:** *'… everybody had clear-cut roles, and so…and they were very keen…you know, they were very suitable for those roles as well.'* **Interview 1, Project lead 2, HASU 1:** *'I think from the very beginning we knew exactly what we were doing, and whose responsibility was what. And, I think that helps...you can't say "oh, there was five people all going to sort that out, which one actually did do it?" So I think by keeping it small and then spreading it out it does help from the beginning.'* **HASU 2:** Interview and non-participant observation data reveal internal project team not in fully in place until after 'official' bundle launch in April 2017; this meant that initially, roles were less well defined within the internal project team. **Interview 2, Project lead 3, HASU 2:** *'Because I realised when I got into post, how much catching up we had to do... Because there was nobody who'd taken control of where we were up to… So I think that's why, initially, we were a little bit behind everyone else with the data collection. And, you know, somebody to actually coordinate that everything was being done, rather than people assuming...that things were being done.'* **Interview 1, Data collectors: HASU 2***:* *Data collector 1: [being involved] from the beginning would have been easier.* *Data collector 2: It would have been fine, yeah.* *Data collector 1: It's when, you know you've got the backlog, it's…daunting…catching up….You know, which I've still got [to do].* *Data collector 2: 'Cause what was it? Like, six months in when we started to do it?* *Data collector 1: Yeah.* **Interview 2, Project lead 1, HASU 2: '***I mean I think [implementation has] been a bit of a slow process. The delay in the app, I think, has not really helped matters, because we kept thinking the app was coming, and it's going to sort all the problems out, and it didn't.'*
	Gaining executive buy in provides support to internal facilitation team and makes them accountable	**HASU 1:** Action logs identify that the internal facilitators were responsible for feeding back progress to their executive team; this was considered to provide accountability. **Project Document: Action Log 17.10.17:** *'Results up to first week were analysed and compared to the data from six months prior to the first week of October. There is good improvement in both arms, yet there is good scope for improvement. Issues occur when patients attend late at night or come via a FAST negative route. Some issues with frequency of blood pressure monitoring – how often and when to step down. These are to be presented in the stroke governance board tomorrow and on 29 Oct to stroke quality board'.* **Interview 2, Overall project lead:** '*So I think they've always thought that they're accountable to the Executive on this project. So, I think that's why getting that very early buy-in from the Executive's really important actually because I think they… perhaps get the support they need because of it and then they also feel they're accountable going back to them at the end. So, that's a key lesson, I think from there…'* **HASU 2:** Interview data identifies that internal project team did not gain executive buy in: **Interview 2, Overall project lead:** *'…we didn't get Executive buy-in at all there. There was no sort of Executive sponsor for the project. […] there might have been a degree of accountability, so they might have felt they were accountable to the Trust Executive making this project work and I think also they might have been able to get more resource if they needed it.'*
	Engaging with relevant clinician groups early key to successful implementation	**HASU 1:** Evidence from action logs, show that internal facilitators started to engage with relevant clinicians groups in January 2017 (3 months prior to bundle launch). Action logs provide a description of action to be taken, person responsible for actioning, due date and status/remarks. For example, the project document: action plan 13.01.17 states: *'Liaise with critical care of plans and expectations and identify… a local lead'* **Interview 2, Project lead 3, HASU 1:** *'Get as many people on board from the minute you start, across your disciplines… and that's also educating your therapists as well, because if you've got a whole team having knowledge of why we're doing what we're doing, I think that helps. Like I say, we have broadcast it across the other disciplines as well. Obviously, your main ones are your medics and your nurses, and you get your pharmacy on board as well.'* **HASU 2**: Interview data from internal project team reveal a lack of engaging relevant clinicians at the beginning of the project. **Interview 2, Project lead 1, HASU 2:** *'How would I do things differently? I think I probably would have involved A&E and medicine earlier in the project. I think we focused on our own patch, not realising that actually these patients are not coming to us. So, I think I would have probably targeted the A&E and MAU a lot earlier' […] I think the thing about this project, is that at the moment, the team is just me and [names other internal project team] and dare I say we need to try and make it the whole stroke team's problem, rather than just our little project'*
	Well planned launch event helps early bundle adoption	**HASU 1:** Evidence from interview data show that the internal project team organised a well-attended launch event: **Interview 1, Overall Project lead 1:** *'They sorted this very, very, successful…couple of hours out where their chief executive came and was very enthusiastic about the project, introduced it all and they...it was really good…because it immediately said to everybody there that, you know, this is important to the trust, the chief executive's turned out to talk about it.'* **Interview 1, Project lead 1, HASU 1:** *Q: 'How…how many people turned up [to the launch event]?* *I think it must have been at least seventy people. At least, yeah. So that was number of people signed in. There may be people who do not sign in and who may come later on as well, so…the stroke team turned up. I think except in A&E, um, a lot of stroke team turned up, there were nurses, therapist, even our pharmacist was supporting the project turned up as well.'*

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		HASU 2: Interview evidence identifies that while internal project team organised a launch event it did not appear to be well attended (nor attended by anyone outside of the stroke team). Evidence to suggest that it was not well advertised **Interview 1, Project lead 3, HASU 2***: 'I think, from not being as involved in [implementation of the bundle] [back] then, I don't think it was made as prolific, you know, as, as it could have been. I think, from looking at, maybe, I think [HASU 1] had a bit of a launch date, you know, and things like that. I knew [implementation of the bundle] was coming, but it, it wasn't very, you know, "right we're starting this", you know. And I don't think, I think they could have probably … highlighted it more...just made it a bit more of a priority, you know. That "this is what's happening", and it could have been launched a little bit better, I think. But it was a difficult time, because we were in-between [stroke nurse consultant] leaving as it was launched. And, you know, I think she'd sort of really...led on [implementation project]…'*
	Close monitoring of data and feeding back results to clinicians helps successful implementation	**HASU 1:** Interview data shows that successful implementation was linked to close monitoring of data – to learn from every patient; this was in keeping with what they had done when they implemented thrombolysis at their unit. Project lead 2, conducted 'debriefs' after every ICH case in first few months of the bundle being implemented, this was conducted with the staff (bleep holder nurse and Dr on call) who had attended the patient in HASU ED. This, together with project lead 3 monitoring the data Monday to Friday, enabled them to identify issues and improve delivery of bundle for the next time: **Interview 1, Project lead 2, HASU 1:** *Q: I remember you saying… that after every bleed you'd been having like a de-brief with your staff?* *'Yeah, like a little mini review of everything that happened. And that was the best thing really. And I think we got the most learning out of having a little sit down and go through them all afterwards, because we kind of looked at them. We do ones...we still do it now with thrombolysis patients.'* **Interview 2, Project lead 3, HASU 1:** *'Well, the last [new nurse bleep holder starter] would have been about a month and a half ago. So, I noticed.....because, obviously, as I'm pulling data, I'm reading through all the HASU ED paperwork and I picked up that she was stopping the infusion when it got into target, so like on the under six hours, between 130 and 140, then she'd stop the infusion. So, I've had a natter with her and said, "no, you don't stop it then, you only stop it when it goes below 130", "right okay". It's just that straight one to one interaction that picks up issues as we're going along.'* **HASU 2:** Problems were identified with data collection in July 2017 at the first all-site collaborative meeting, as the relevant data had not been collected or sent to external facilitation team in time for the meeting: **Non-participant observation notes from collaborative meeting, 14.07.17:** *'The external facilitation team had not been able to plot the data to show median or target times for XXX because their data was missing (as it has not yet been inputted into the dashboard)….Project lead 1, HASU 2 stated that that they need to understand why they are missing this data and come up with a plan to start collecting the data. Overall Project lead suggested that they should arrange a site visit (outside of this meeting) to discuss a new plan of how data could be collected.'*
Facilitation (external)	Importance of collaborative team meetings	**Interview 2, Project lead 2, HASU 1:** *'I like [the collaborative meetings]. I think it's done us the world of good. I think I've got quite a good relationship with [External Facilitator – specialist nurse who supports sites to implement the bundle] now so we can bounce ideas off each other a lot. And I don't think we do enough of that. And I think it's good to share that information. And I think that's the same with anything. You know, I think even in a hospital setting we don't mix with surgery, orthopaedics, other things every often in the hospital. And you can get so much out of each other. I think sharing information is just as important. There's no point in keeping it to yourself.'* **Interview 2, Project lead 1, HASU 1:** *'but we had a chat with [overall project lead] as well because we had this three or four monthly meeting with the haematologist and the neurosurgeon and the three different hospitals together [all site meetings], so it would be good if we can continue that long-term, because then we can all discuss what are the latest developments in ICH and then learn from each other as well, so that could continue. So the plan would be to form a specialist regional ICH group'.* **Interview 2, Project lead 3, HASU 2:** *'I don't think it would be a good idea for the [sites] to be sort of just left and say right, we're done now, carry on. I think there still needs to be some collaboration, do you know what I mean, because everybody then starts to do a bit of their own thing, don't they? Which is not always best evidence and I think if we're all providing the same care we should all be doing the same things.'*
Context (inner)	Adapting bundle to local contexts/adapting local contexts can improve process target times	**HASU 1:** Action logs, documents and interview data show that ahead of bundle launch, they: • Developed and agreed a protocol so stroke clinicians no longer needed to contact haematology prior to administering certain anti-coagulant medications – this required governance approval • Bought a fridge to store anticoagulant medication in their dedicated HASU ED in order to reduce times for delivery (prior to this, it could take up to 30 mins to collect anticoagulant medications from haematology) • Changed 1st line anti-hypertensive intravenous medication to GTN so that iv medication titration could be done by nursing staff – this required governance approval **Interview 1, Project Lead 1, HASU 1***: '…we, had a discussion, with [overall project lead] regarding, you know, how to reduce the times. And one of the things he said was, "yes, one of the…the blockage in the pathways, they need to discuss with the haematologist to get approval for the anti-coagulant reversal, the medication".* *[…]* *So then, er, this was part of the pathway we had to amend, so that one was that we did not need any haematology consultant approval before we did it. And the second was approval for us to locate the drug in the HASU itself, so rather than in the transfusion department. So, that needed funding and that needed safety checks. So we needed a fridge and some protocols to regularly check whether the thermostat has been working.'* **Interview 1, Clinician delivering bundle, HASU 1**: *'…we're using GTN a lot more now whereas before, sort of, I think Labetalol would be our first measure…I think it's much better…you've just got that continuous infusion that you can just alter, rather than keeping having to give a bolus to the patient'*

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		HASU 2: Already had a protocol in place (prior to bundle launch) to enable delivery of anticoagulant reversal without haematology input, but interview data shows that stroke team were not aware of this prior to bundle being implemented: **Interview 1, Project Lead 1, HASU 2:** *…'so I think that the people weren't even aware that within our pathway there was… actually already in the pathway, but yet everyone was ringing the haematologist for use of Beriplex…even though the pathway said we shouldn't…Er, but we were having to ring regarding DOACs.'* Again, learning lessons from Salford implementation, HASU 2 also adapted their local protocol to enable GTN to be used as first line antihypertensive medication. However, observation notes identify that this was not always adhered to. **Non-participant Observation Notes from Re-launch Event, HASU 2** in June 2018: *Another clinician then asked [Project Lead 1] whether they should be using Lobetalol or GTN as first line treatment. [Project Lead 1] stated that he wanted to discourage the use of Lobetalol because it meant that the Doctors had to give the initial bolus and that nurses could titrate GTN so they were not dependent on Dr availability for BP management. This led to a discussion about whether this was 'Trust Policy' – [Project Lead 1] stated 'yes' it was trust policy, but one of the (locum) Drs was adamant that Trust policy was to use Lobetatol as first line (however, a number of Drs and Nurses in the room stated that this was incorrect).*
	Contextual differences (e.g. structural and organisational) impacts upon success of bundle across the different sites	**HASU 1:** **Interview 1, Specialist Nurse, External Facilitator:** *'I think [HASU 2] are more similar to us, in the fact they've not got the kind of like separate stroke beds [in emergency department]. I think stroke seems to be regarded as really important in [HASU 1's hospital trust], whatever they wanted to do in terms of the project…So, I think everyone's really invested in stroke at [HASU 1's hospital trust], um, I think it's one of their main specialities, whereas here we have lots of specialities so everything's a lot more kind of spread out. So, I think, I think that's one of the reasons [HASU 1] might find things a little bit easier to get, like protocols to push through and things because they do seem to be very well, not looked after, but, very well-funded and things over there. As opposed to the other two trusts.' A01, 1st interview* **Interview 1, Project Lead 1, HASU 1:** *'one of the key parts of, er, the…the implementation would be…the acute stroke nurses…we have one nurse allocated to the acute stroke team, er, full time, so seven days a week, so from seven am 'til nine pm. Which is different from other hospitals…so…they also perform a good part in [implementation of bundle]'.* **Interview 1, Project Lead 3, HASU 1:** *'I think a lot of that is about the HASU system, because we've got a confined number of staff in a confined area in A&E, so we've got our own porter for taking people to CT scans, so we can get that done quickly…so the speed of getting a CT ordered, CT done, back and knowing it's an ICH and we don't wait for results coming through from radiology, 'cos our doctors read the CTs, so they can make the decision whether there's a bleed there or not.'* **HASU 2:** During interviews and at non-participant observation at meetings, it was identified that HASU 2 had high number of nurse vacancies and a lot of locum doctors – suggesting that implementation of the bundle was not top of their list of priorities. **Interview 1, External Facilitator team (Stroke Consultant)***: '[HASU 2] were supposed to start in April, they started round about May. Just a lot of it is that they are busy with other things. Their attention is kind of directed towards more day to day functional, kind of, let's try to get through the day kind of aspects. Have we got staff? You know, Have we got beds to put our patients in, never mind giving the GTN on time. So, they've got bigger fish to fry, I think.'* **Interview 1, Clinician using bundle, HASU 2:** *'We've got a lot of pressures which every area has at the moment. We've got a massive shortage of staffing so the nurses are really, really short and we're really under pressure and we've got eleven [nurse] vacancies right now…we've got a lot of agency staff…so there's a lot of staff that don't know what they're doing…it's that core few of us that are trying to do everything.'* **Interview 2, Project Lead 1, HASU 2:** '*A big challenge for us is the fact that our [acute assessment] nurses are also being used to run the wards and manage the wards…if I'm honest, of late we've even had situations where the [acute assessment] nurse can't come down to A&E to help us out. Because, we've got no staff on the wards. And we've now 11 and a half vacancies in our nursing numbers in the hyper-acute unit and the acute stroke unit and it's really putting a lot of pressure on the thrombolysis pathway, never mind the...intracerebral bleeding pathway.'*
Context (Outer)	Changes to data collected via SSNAP perceived to influence bundle implementation	During the time of implementing bundle, new targets were added to the SSNAP database for all hospitals to collect in relation to ICH care. Interview data identifies that facilitators felt that this might improve ICH care and influence bundle implementation, as they were now being monitored on ICH targets. **Interview 2, External Facilitation Team (Specialist Nurse):** '*Yeah, we've got our data in SSNAP now, for the blood pressure lowering targets and the door to needle for reversals…I think that definitely has an affect on everything else you do… it's really scrutinised […] one of the advanced nurse practitioners looks at [the data] every month…she'll go through everything, and if a certain area has slipped, she's the one to go and let them know.'* **Interview 2, Project lead 1, HASU 2:** '*I think it's good to have a registry of this nationally, because it's always good to compare yourself with others. But also if we find that you're not delivering on that target, then that becomes a reason to try and improve it. So, I'm hoping that if the…haemorrhagic strokes are going to go onto SSNAP, that we will see a similar necessity to address these shortfalls, than we maybe... having being through the thrombolysis pathway and SSNAP…I encourage that kind of ordered process, because it does drive change.'*
Innovation	ABC-ICH bundle is a systematic way to deliver ICH care	**Interview 1, Clinician delivering bundle at Salford HASU:** *'Before we had this bundle, there wasn't really any kind of guidelines of what to do. There was just kind of like…a bit of guidance on what you should do for blood pressure but there wasn't anything, like, set in stone, so I remember, like, when it first, like they first started talking about it, I was really pleased, because for a long time, the focus had been …on ischemic stroke with thrombolysis…And it was really difficult, because…if you were working with a doctor that wasn't really familiar with haemorrhagic stroke, and how, like, people could quickly go downhill - it was a bit worrying, really.'* **Interview 1, Clinician delivering bundle, HASU 2:** '*To be honest with you…I have very little guidance, what should I do [with ICH patients]…we obviously knew to call neuro surgeons, we obviously knew to do the Beriplex and we obviously knew to control the blood pressure, but [ABC bundle] has guided us that how should we manage an [ICH]… because that tells you how aggressive you should be in the first twenty-four hours which is crucial…So those things became more clear basically…so everybody knows what to do'.* **Interview 2, Project lead 3, HASU 2:** *'The evidence is there…its research based…So, nobody's argued...about whether it needs doing or not doing.'*

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	ABC-ICH bundle 'guides' care and leads to culture shift	**Interview 1, Clinician delivering bundle, HASU 2:** *'I just felt like we're doing haemorrhagic stroke patients justice. Before, when we admit a bleed patient, we kind of treat them different …let's say if a patient came back from scan and we found out it was a bleed, so okay, we can calm down. But we act differently now…because if they're a bleed then we have to act with this GTN infusion within the hour and all that…like there's a balance now".* **Interview 1, External Facilitation Team (Specialist Nurse):** *'So I think it's more to do with "oh it's an ICH, it's a death sentence, sort of thing, to oh no, we're doing stuff, we're making these people better. And just a shift in culture, really".*
	Concern whether ABC-ICH bundle increases disability in surviving patients	**Interview 1, Project lead 2, HASU 2:** *'But it has to be, you know, decided in a way is the aim of just applying the bundle and making the patients living with greater disability, or actually no, this is not the aim of it. This yet to be found and this is yet to be answered. And I have to kind of say, at the minute I don't know, let's hope.'* **Interview 1, Project lead 3, HASU 1:** *'… that's the question now with the ICH work…whether you bring the mortality rate down, but you end up with a lot of physical disability in the long term … so obviously that's where these six month reviews will come in, but at the end of the day, from the point of view of [implementing ABC bundle] we don't have an issue with that at all because we need to do these sort of things to see what happens.'*
Recipients	Emergency department staff not adhering to ABC-ICH bundle	**Interview 2, Project lead 3, HASU 2:** *'… one of the things that I got from one of the senior [nursing] staff in A&E last week was "well we refer all strokes overnight to [Salford], but we don't refer bleeds"… it stunted me a bit, I was like, "but it's a stroke", they were like, "… we refer them to neurosurgeons, we don't speak to stroke, we only speak to stroke about strokes". And, you're like, "but it is a stroke"…so I think there is definitely some bits of education some might [need]. And, because you understand it…you think other professionals understand it all…'* **Interview 2, Project lead 1, HASU 1:** *'Q: Do you feel that that's become part of routine care … here?'* *It is among the stroke team it is, yes, so I think everybody is aware of the three parts, the A, the B and the C. But I think a little bit is lost when it comes to medicine or casualty and sometimes they may come in the night and they're not treated on the pathway'.*
	Part C of bundle less successfully implemented	**Interview 1, clinician delivering bundle, HASU 1:** *'I understand that there's a criteria [when to refer to neurosurgery]…but sometime, in the acute setting when these people present… [it] makes it very difficult for [clinicians to know] which to refer and which not to refer and then probably the easiest answer is to refer and get the specialist opinion and I think this is what we've come up with'.* **Interview 1, Project Lead 2, HASU 1***: And I don't know whether they're still referring more than they should…And I think sometimes that's all about risk, isn't it? And…the doctors having the confidence to go "actually, no, I am not going to refer this patient…I know that the bottom line is that it's going to be conservative management and they're not going to do anything vital, and they're probably going to say no"…They want the neurosurgeons to go "no, we're not going to do anything". Cause then to the family you're saying "I didn't make that decision, they've made that decision'. C02, 1st interview.* **Interview 1, Project Lead 3, HASU 2***: "I still think people are living in a culture of, let's be sure, lets speak to [neurosurgery]… I agree that people feel that families need to hear that we've made that conversation… But…we need to educate people to… tell families why we're not referring, as opposed to, why we are referring. So I think that's something that will take longer [to implement]".*
	Greater communication required between specialities	**Interview 1, project lead 2, HASU 2***: "one of the cases we looked at was, we'd struggled to manage the blood pressure, but we just persevered, you know, at ward level. And we opened up a bit of discussion about referral to critical care, and we just got a laugh from everybody; as if to say, "critical care would never be interested"… I think we're still not very good at making that referral.* **Interview 1, External facilitation team (Neuro Specialist**): *"But I know that behind the scenes it's changed a lot in that erm, we certainly would talk about a lot more patients between specialities. So neurosurgery and stroke [talk] about those people that they're worried about…But again, it's still [overall project lead] and I. So I still don't get the Joe Bloggs stroke physician coming up to see me."*