Appendix

Table A: Factors that would improve implementation of digital aids in health care in Malawi: Themes, subthemes and example quotes

Table B: Positive and Negative Initial perceptions of NeoTree; Themes, subthemes & example quote**s and** recommendations for successful implementation of the NeoTree

Table C: Usability workshop themes and associated changes made

Table A: Factors that would improve implementation of digital aids in health care in Malawi: Themes, subthemes and example quotes.

Subthemes	Example Quotes
Theme: Person dependent factors	
Ability to update yourself	*"we are not good at updating our self" [CO3]*
familiarity with the system	*"it all goes with who is that and how familiar you are with the system" [CO5]*
positive attitude	*"some people … don't move with technology they are lacking behind… the best way how they operate, is just to be reserved, they just deny the thing that no, I cannot use it" CO3* *"instead of saying teach me… they choose not to learn things" [N11]* *"am not saying people should be difficult, expect the scene to come out." [CO3]* *"belief is the extra work" [CO2]* *"to be new to the algorithm digitally, so…you may think it's delaying you" [CO3]*
empowerment	*"we need to empower those that are placed" [CO7]*
Theme: App dependent factors	
responsive	*" it doesn't help up on the spot… the help or usage (should be) immediate"[CO2]*
timely	*"now the print out has not been produced… if it's capable [of producing timely print out of data] then fine" [CO2]*
Theme: System / process dependent factors	
equitable access	*"if resources are there everyone should have it" [CO3]*
sustainability	*"the other… is sustainability" [CO2]*
fast network	*"maybe the internet is slow or shutdown" [CO2]*
maintenance team	*"there should be a team which look in to the functionality of the gadgets to see if it's working to the desired standards" [CO5]* *"there are… breakages, damages, or need for repair and takes time than now" [CO5]*
ownership	*"what is needed is ownership" [CO2]* *"responsibility to maintain should be left to an individual. Usually abuse comes in when it is not specifically given to an individual." [CO3]* *"proper handover of the gadget. If we leave them like the ground phones, then we would have a problem" [CO2]*
security	*"I have fear of security" [CO3]* *"maybe you can put a tracker on it [the tablet], an identification, that if it gets lost" [CO8]*
streamline process	*"we have a lot of data tools to be completed… " [CO7]*
proximity to clinical care	*"they [data collection staff] should not just be in the office, but still they can be on the ground and do ABCD" [CO7]*
integrate systems	*"I think we should start with the health centres as well because there are times the babies story is not present" [CO9]*
infection control	*"I think infection prevention procedures need to be considered" [CO8]*
Resources	*"maybe should increase the number of [tablets]"[N7]*
operating system	*"it should not allow installations of other apps, like WhatsApp, games, Zuma" [CO8]*
device	*"I think it would be easier using a tablet [compared with a phone]" [CO6]*
Theme: Community education (no subthemes)	
	"I think acceptance from the community" [CO8] *"I think we should learn to explain…they [parents and guardians] will understand" [CO9]* *"before we introduce those things, we need to go on the media, radios, and TVs, and explain..." [CO7]*

CO = clinical officer, N = Nurse

Table B: Initial perceptions of NeoTree; Themes, subthemes & example quotes

Subthemes	Example Quotes
Theme: Positive perceptions	
confidence	*"the app it gives the person the confidence… even I might not know but when I am on this app it will guide me and I will do the right thing" [CO2]*
guide	*"it could be [a helpful diagnostic tool" [CO2]* *"if almost all the differentials that are coming out there more less like we didn't think of them at the first instance, I think it will ring an alarm to say, at least you have to familiarise yourself with other…" [CO3]*
overall chances of success	*"at first it may be a problem but as we go along I think we might get used to it" [CO4]* *"it's [the NeoTree] a good idea" [almost all participants]* *"it's going to succeed" [CO5]* *"it will succeed" [N12]* *"it's a very good idea, only that there is time you are just piloting so I think maybe you might not feel the goodness of it because it will have some hiccups but once its finalised I feel it will be a very good development" [CO8]* *"[it will succeed] provided we are willing" [CO9]*
data collection function	*"if we strict ourselves to use, to correct use of the gadget, I think it would be a tool for data collection or monitoring" [CO3]* *".. it's a good one because we have all the information there, important information, other using our old way, because we miss some of the information" [CO4]* *"it will help … data collection and training, but not diagnosis" [N7]*
training	*" I think with that it could give the confidence… by using the app regularly you may get used and maybe sort of memorize even in a situation without an app you will remember that aah with these hypothermia I will do ABCD." [CO2]* *"people will love it because it is a learning point" [CO2]*
reduce waste	*"I think it will to solve these other problems of stationary" [CO8]*
time saver	*"I don't think it's a bad idea… it is time saving" [N14]*
Theme: Negative perceptions	
conflict with protocols	*"sometimes because may be gloved and you are maybe touching the baby, so it wouldn't be ideal that you can take out the glove…" [CO2]*
parental/ guardian perception	*"looking at the guardian, they will think you are playing on the tablet" [CO4]*
Theme: Recommendations for successful implementation of the NeoTree	
attitude	*"it will start with us, if we have an interest in it, a positive attitude, it's going to succeed." [CO4]*
Back-up power to printer	*"I don't know for the power… because now we are experiencing blackouts"*
leadership	*"it will be put in the hands of the in charge, who will foresee the functioning and management of this thing" [CO3]*
teamwork	*"why should it succeed if empowered to only one person" [CO3]*
training	*"if they are like trained on how to use that tablet, it will be easy" [N7]* *"we need trainings" [N1]* *"it you don't know how to operate it will delay management of the kid" [N4]* *"a single training, I don't think will change our mind to start… we should continue reminding each other…" [CO8]*
ensure fast system	*"when you are using electronics and it takes forever people will opt for the manual [system]" [N7]*

CO = clinical officer, N = Nurse

Table C: Usability workshop themes and associated changes made

Theme/tag	Feedback	Change
Type of question	Yes/No check-lists confusing as some questions became double negatives	Check-lists changes to single choice lists for • ANC care • TTV doses • Musculoskeletal problems
	Didn't appreciate they could pick more than one answer	Added clear instructions on difference between single choice list and multiple-choice lists
Sequence of fields	Sequence of family history section difficult & time consuming to complete	Remove family history section from application for now
Language	Confusing words included: *'soft abdomen'* *'head bobbing'* *'tracheal tug'* *'dysmorphic'* *'> 3 secs'* *'RDS'*	Changed to 'soft and normal' Changed to 'head-nodding' One HCW didn't understand this term but all others did so not changed Changed to 'abnormal facial features' Changed to 'more than 3 seconds' Written as 'respiratory distress syndrome'
Completing fields	Tried to enter APGARs out of 10	'Out of 10' added to APGARs question
Using timer	Clicked away from timer	Specific 'tap-area' added
Understanding instructions	- Usually measures capillary refill time peripherally - Didn't understand 'crease' in instruction for feeling femoral pulses - Don't usually check pupils, pen-torch not available - Not confident using stethoscope	Changed CRT to peripheral (later changed back to central and picture added) Picture added Pupillary examination removed Stethoscope mode added (later changed to – are you confident using a stethoscope?)
Length of question	Long button labels for feeding question, took a long time to read all options	Buttons labels made more concise
Information not available	Unknown option needed	Option added to just click 'no' if unsure Unknown option added for ANC visits etc.
Proceeding through the app	Tried to click on question text rather than answer line.	Clearer instructions on how to proceed through the app at the beginning
	Apgars not available- couldn't proceed	Field validation changed to optional to account for out-born babies referred with no apgars available Extra question added – 'Did the baby cry at delivery?'
Navigation	Navigation pages were well understood Occasional clicks on the navigation bar were attempted	Consider removing these as add time, but with practice they will be better appreciated
Drop-down menus	• Religion • Health facility • Cadre	- Specific Malawi denominations added - All nearby health centres added - Community NMT / technical officer added

ANC = Antenatal care, TTV = Tetanus toxoid vaccine, secs = seconds, RDS = respiratory distress syndrome, CRT = capillary refill time, NMT = nurse midwife technician