

1 Neither magic bullet nor a mere tool: negotiating multiple logics of the checklist in healthcare quality  
2 improvement

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## 6 **Abstract**

7 Over two decades, the checklist has risen to prominence in healthcare improvement. This paper  
8 contributes to the debate between its proponents and critics, making the case for an STS-informed  
9 understanding of the checklist that demonstrates the limitations of both the 'checklist-as-panacea'  
10 and 'checklist-as-socially-determined' positions. Attending to the checklist as a socio-material object  
11 endowed with affordances that call upon clinicians to act (Hutchby 2001, Allen 2012), the study  
12 revisits the efforts of a recent improvement initiative, the Enhanced Peri-Operative Care for High-  
13 risk patients (EPOCH) trial. Rather than a singularised simple tool, this study discusses four different  
14 and relationally enacted logics of the checklist as a stop and check tool, a clinical prompt, an audit  
15 tool, and a clinical record. Each logic is associated with specific temporality, beneficiaries,  
16 relationship to material forms, and interpellates (Law 2002) clinicians to initiate specific actions  
17 which can conflict. The paper seeks to make the case for intervention to improve such tools and  
18 consciously account for the consequences of their design and materiality and calls for supporting  
19 such settings and arrangements in which incoherences collected in tools can be locally negotiated.

## 20 **Word count**

21 8371

## 22 **Key words**

23 checklist, healthcare improvement, affordances, multiple logics, socio-material infrastructures

## 24 **Introduction**

25 In the new millennium, the checklist rose to global prominence in a series of well delivered pilot  
26 projects followed by the WHO recommending that all hospitals use this device in surgery (Haynes et  
27 al 2009). In the UK, by 2012, around 2000 institutions had tried the checklist in daily practice for  
28 procedures in specialisms ranging from surgery and anaesthesia to childbirth and swine flu (Anthes  
29 2015). A best-selling apotheosis of an effort to promote the checklist was Atul Gawande's (2010) *The*  
30 *Checklist Manifesto* which placed the checklist within the wider arena of quality improvement,  
31 insisting that doing simple things right and consistently can fix many problems and challenges of  
32 modern medicine characterised by an ever-increasing complexity. Simple tools such as checklists  
33 were argued to provide far better outcomes than any individual pill or the best-trained surgeon  
34 (Gawande 2015). The turn to improving care through checklists was further underpinned by strong  
35 theoretical framing in systems thinking, behavioural psychology and epidemiology (Zuiderent-Jerak  
36 and Berg 2010, Waring et al 2016) combined with rigorous process control adopted from the  
37 manufacturing sector (Pronovost et al 2006, Hales and Pronovost 2006, Jammer et al 2015, Parry  
38 2014). While some research reported mixed messages about its effectiveness (Urbach et al 2014,  
39 Treadwell et al 2014), quality improvement in healthcare, with its emphasis on low-tech strategies  
40 and mundane artefacts and formal tools to ensure behavioural change (Perla et al 2013, Marshall et  
41 al 2013, Parry 2014), provided a fruitful platform for the checklist's rise as a simple yet powerful  
42 instrument for standardising clinical practice and improving healthcare outcomes.

43 The rise of the checklist has not passed unnoticed by sociology. Critical examinations pointed out  
44 that the checklist may have been regarded by too many as a 'magic bullet' ready to effect positive  
45 change irrespective of context (Dixon-Woods et al 2012). Such critique, often drawing on  
46 ethnographic insights into how clinical tools work in their environments, argued against attributing  
47 improved outcomes solely or primarily to the checklist (Bosk et al 2009). Some argued that  
48 promoting checklists as a powerful solution to complex problems was an oversimplification and a  
49 distraction (e.g. Catchpole and Russ 2015) – technical solutions could not resolve complex social  
50 problems such as behavioural change in healthcare settings (e.g. Bosk et al 2009). Arguably, the key

51 point made by these authors is not that checklists don't work, but that they don't work *alone*. Unlike  
52 checklist enthusiasts, critics showed how success of improvement initiatives, rather than technical  
53 fixes, relied on an interplay of social factors, cultural values, practices and negotiations. All along, it  
54 was arduous work, often laden with emotions (Dixon-Woods and Martin 2016, Dixon-Woods et al  
55 2012, Aveling et al 2013).

56 In this paper we contribute to this debate between proponents and critics of the checklist. We  
57 suggest that this debate risks generating conceptualizations of the checklist in healthcare  
58 improvement may oscillate between viewing it as either a 'magic bullet', or a 'mere tool', animated  
59 (and dominated) by social forces. We argue that to understand the role and power of checklist in  
60 today's healthcare, we need to attend to its materiality in action. To do so we mobilise insights from  
61 Science and Technology Studies (STS) about how mundane artefacts act, and are acted upon, in  
62 socio-material arrangements of healthcare. In particular, we draw on the work of Davina Allen on  
63 the 'affordances' of tools (Hutchby 2001, Allen 2012, Allen et al 2016, Petrakaki et al 2016) and  
64 expand it by using the notion of 'multiple logics' (Law 1994). With this analytical sensitivity, we  
65 revisit ethnographic data collected as part of an evaluation of a recent initiative in the British  
66 National Health Service (NHS) aimed at improving emergency surgery. Our findings show that in  
67 everyday improvement practice, clinicians did not engage with a 'simple checklist' endowed with a  
68 single set of affordances. We argue that the affordances of the checklist clustered to identifiable  
69 different logics inscribed in larger infrastructures of healthcare (and beyond). We show different  
70 versions of the checklist that were relationally enacted at different times: the checklist was at one  
71 time a stop and check tool, at another time a clinical prompt, an audit tool, or a clinical record. At  
72 the sharp end of improvement projects, we also observed an interplay between the logics. This  
73 interplay at times created practical tensions for clinicians. Both proponents and critics tend to  
74 understand tensions and uncertainties around the checklist as a function of clinical resistance,  
75 ignorance or mismanaged projects. We suggest, rather, that tensions were part of the checklist's  
76 materiality whereby different logics prompted clinicians to undertake specific actions, within a

77 specific temporality and for specific beneficiaries. These actions, timescales and audiences were not  
78 always incompatible. But often they also created frictions that needed to be negotiated by clinicians  
79 in everyday encounters. This allows us to see practical tinkering with the checklist not as singular  
80 enactments but as patterned activity whereby the logics are further stabilized (or not) in healthcare.  
81 Our findings have implications for understanding the ways improvement tools shape clinical actions.  
82 After further revisiting the checklist debate to add a third theoretical perspective in the next section,  
83 and accounting for our methods, we outline findings about how hospital-based improvement teams  
84 in our study used a specific tool, which followed the checklist format, the pre-operative 'boarding  
85 card'. In the concluding discussion we highlight implications for theory and practice.

#### 86 **Bringing STS to the checklist debate**

87 The rise of the checklist in medical practice provoked a critical response from sociologists and  
88 clinicians who pointed out that the checklist enthusiasts and the WHO recommendations may have  
89 overstated the significance of the checklist (e.g. Dixon-Woods et al 2011, Aveling et al 2013). Critics  
90 revisited one of the successful studies cited by those promoting the checklist, the Keystone  
91 improvement programme in Michigan, US, which reported a large and sustained reduction in rates  
92 of catheter-related blood stream infections in Intensive Care Units (Pronovost et al 2006). The  
93 triumph, which led to 50% reduction in deaths, was ascribed by some to the checklist. The response  
94 argued that "the mistake of the simple checklist story was in the assumption that a technical  
95 solution (checklists) can solve an adaptive (sociocultural) problem" (Bosk et al 2009: 444). Arguably,  
96 checklists were but one component in the composite reality of healthcare, which was "messier" and  
97 more complex than checklist proponents imagined. Improvements that worked involved the  
98 creation of social networks with a shared sense of mission, whose members were each able to  
99 reinforce the efforts of the other to cooperate with the interventions. An *ex post* reconstruction of  
100 the Michigan project confirmed that the success of Keystone dwelled in reframing clinical issues as a  
101 social problem which involved human action and behaviour, creating social networks to generate a

102 wide buy-in, and using persuasive techniques such as storytelling and ‘hard data’ (Dixon-Woods et al  
103 2011).

104 Both advocates and critics deployed specific notions of agency in their understanding of the checklist  
105 and the role of the context in affecting success of medical actions. Advocates called the checklist a  
106 simple and powerful improvement tool, and promoted it as an effective way of managing  
107 complexity. To them, success was inherent to the tool while failure may occur as an effect of  
108 external influences, namely people mishandling the checklist. If used wisely, checklists are said to be  
109 able to reduce ambiguity and enable clinicians to perform required tasks consistently (Gawande  
110 2007, Walker et al 2012). Critics suggest that, rather than a magic bullet, the checklist is dependent  
111 for success on the social context of its use. Where advocates of the checklist understood success a  
112 function of the checklist and failure a social outcome, critics pointed out that, in fact, *both* failure  
113 and success are determined by the interplay of social factors, cultural values, practices and  
114 negotiations. In these accounts, the checklist becomes uninteresting compared to the forces that  
115 animate (or inhibit) it. Nonetheless, both camps agreed that investing in ‘social contexts’, namely in  
116 interventions such as education and coaching of clinicians (Low et al 2012) and effective leadership  
117 (Conley et al 2011), need to be understood as key to successful improvement (Brown and Calnan  
118 2011, Bosk et al 2009). After all, both agree that “the main challenge to [implementation] lies within  
119 us” (Low et al 2012: 1030).

120 This accentuation of the social and organisational context in both the ‘magic bullet’ story and its  
121 critique has meant that the question of the materiality of the checklist remains under-researched  
122 and under-theorised. To advance the debate, we turn to STS, and more specifically to Davina Allen’s  
123 call for considering how ‘affordances’ of mundane technologies, such as the checklist, relate to the  
124 socio-material infrastructure into which they are introduced (Allen 2012: 461). Despite its contested  
125 ontology (Parchoma 2014), the concept of affordances has been widely used in studies of medicine  
126 (Allen 2012, Petrakaki et al 2016) and other areas (Zammuto et al 2007, Leonardi 2011, Koed

127 Madsen 2015). Following Hutchby, affordances refer to the “functional and relational aspects which  
128 *frame, while not determining*, the possibilities for agentic action in relation to an object” (Hutchby  
129 2001: 444, emphasis added). We may think of affordances as material ways of calling upon clinicians:  
130 as ‘interpellating’ them towards certain actions and not others (Law 2002). How strong these  
131 interpellations become remains open to interactional negotiations where other elements, both  
132 human and non-human, intervene. In that respect, affordances come close to the classic STS notion  
133 of ‘materiality’ in conveying the idea that technologies exercise agency in the sense they matter  
134 more than mere containers for human intentions and meaning (Latour 2005)—while emphasising  
135 that any such agency is emergent, rather than inherent to the technology. The checklist as a socio-  
136 material object not only emerges in actual enactments, it also has specific consequences in those  
137 enactments.

138 To advance the debate about checklist and its affordances, one of the stories STS have told  
139 consistently about objects and technologies, from aircraft (Law 2002) to bush pumps (de Laet and  
140 Mol 2000) and electronic patient records (Petракaki et al 2016), is that they are rarely “singularised”  
141 – well bounded and organized along a single logic (Berg 1997). The STS stories then often use the  
142 notion of ‘logic’ in plural, referring to multiple versions of an object, each providing it and those  
143 around it with an operational framework for action or a ‘mode of ordering’ (Law 1994). There is no  
144 space for technological (or social) determinism (Latour 2005). Each logic can be associated with a  
145 different temporality, prescribe specific action and a beneficiary of that action, require an action of a  
146 particular speed and rhythm, and make variable demands of others’ actions. Logics also have an  
147 emergent quality. They do not pre-exist ‘practice’, yet they pre-exist individual practices in the sense  
148 of having been enacted in myriad ways before their next enactment. As such they may be learned  
149 about and inscribed into tools. We explore the materiality of the checklist through its various logics  
150 that may entangle and disentangle those around it, and may also conflict with each other. The  
151 checklist, like other technologies, may then perform in incoherent ways (Law 2002).

## 152 **The case: checklist as part of the EPOCH trial**

153 The EPOCH trial, launched in 2014, was a major national project to improve emergency general  
154 (abdominal) surgery in the UK, with 96 NHS hospitals participating in 15 clusters over an 18-month  
155 period. The trial introduced a 36-node list of clinical interventions organised in a care pathway which  
156 set out the ideal routemap for pre-operative, intra-operative to post-operative care and patient  
157 discharge (Pearse et al 2014). Implementation of the pathway was supported by a range of  
158 strategies and tools devised to that end, and shared by the trial coordinators with participating  
159 improvement teams. Clinicians-turned-quality-improvement-leads were prompted to combine  
160 evidence-based clinical practice with thinking about ‘softer skills’ of persuasion, taught how to  
161 understand variation in data, and how to build up knowledge about instigating change. The care  
162 pathway was also subdivided into several ‘bundles’ for ease of implementation and evaluation; the  
163 trial coordinators encouraged improvement teams to use tools such as a ‘boarding card’ to  
164 implement a specific bundle of clinical actions into everyday surgical care.

165 The ‘boarding card’ was a checklist-based tool born out of a list of recommendations published in  
166 2011 by the Royal College of Surgeons (2011) and later systematised into a care pathway (Pearse et  
167 al 2011, Odor and Grocott 2016). The recommendations were also translated into a prototype  
168 ‘boarding card’ tested in an improvement project in southern England (see **Figure 1**), and widely  
169 circulated across clinical communities (Richards et al. 2016). The EPOCH trial coordinators  
170 encouraged participating hospital teams to adapt the ‘prototype’ boarding card to fit their local  
171 improvement needs. As such, the individual checklist-based tools varied in detail while incorporating  
172 all interventions included in the pre-operative bundle of the pathway.

## 173 **Data and Methods**

174 Data used in this paper come from a qualitative sub-study in six hospitals which ran concurrently  
175 with the EPOCH trial. The trial itself followed a stepped wedge cluster randomisation format with

176 gradual activation of clusters of hospitals into the trial. The six sites selected for the sub-study were  
177 activated at various points, allowing for differences in length of engagement. Consequently, the  
178 volume of collected data ranged from 20 interviews and 54 hours' observation in Site 2 to four  
179 interviews and 18 hours' observation in Site 6. Across all six sites, 54 interviews and over 200 hours'  
180 observation were undertaken. Interviews, mainly with senior clinicians in surgery, anaesthesia and  
181 critical care who acted as implementation leads, focused on capturing key nodes of decision-making,  
182 factors affecting implementation, actors involved and their understandings, and the implementation  
183 tools and strategies they chose to deploy. Observations covered visits to regional meetings  
184 organised by the trial coordinators, local teams' implementation meetings, and various gatherings  
185 called by the improvement teams.

186 The overall ethnographic framework focused broadly on challenges to implementation and was not  
187 designed to collect systematic data on the checklist. When revisiting the collected material for the  
188 purposes of this paper, only data from Site 2 and Site 5 were utilised, as improvement teams in  
189 these sites attempted extensively to deploy boarding cards to improve emergency surgery. Data  
190 from the remaining sites did not allow for a detailed account of local tinkering with the checklist;  
191 they are reported in other outputs (Martin et al. 2017). As part of the original ethnography, all  
192 interviews were digitally audio recorded, and field notes recorded in a diary at the time of  
193 observation, or as soon as possible afterwards. Interview recordings, fieldnotes, and within-team  
194 debriefs discussing the data collected were then professionally transcribed. Analysis of data was  
195 based on the constant comparative method (Charmaz 2007) but informed by theoretical concepts  
196 arising from the literature and from discussion within the team. This process allowed the analytical  
197 construction of four logics of the checklist: some, such as the logics of 'audit' and 'stop and check',  
198 had already existed in different strands of literature and were also observed in the field. Others,  
199 such as the checklist as a clinical record and the checklist as a prompt, emerged because the  
200 interviews and observations offered other and more nuanced positions. The authors then critically  
201 reflected on the autonomous status of individual logics but also weighted their presence and gravity

202 in interactions between clinicians and the checklist. Separating analytically the range of domains  
203 within which logics operated informed this process, as some logics, namely ‘stop and check’ and  
204 ‘prompt’, were alike in terms of aims and beneficiaries and only differed in temporality and rhythm  
205 (see **Table 1**).

206 Ethical approval was given by a NHS Research Ethics Committee, and clearance was provided by the  
207 research governance office of each participating organisation before fieldwork began.

## 208 **Findings**

209 Invariably, for clinicians, the boarding card represented a “singularised” tool with a common name,  
210 printed on a single sheet of paper, which was simple to use and brought together the best of  
211 improvement science and clinical knowledge in emergency surgery.

212           The boarding card. Dead easy. People like it, it focuses the mind. It’s been great. (Consultant  
213           in intensive care and anaesthetics, Hospital 5)

214 Despite the perceived simple nature and singularity of the tool, we account for four different logics  
215 that could be identified in interactions between clinicians and the boarding card: stop and check;  
216 prompt; audit; and clinical record (see summary in **Table 1**). After their empirical exposition which  
217 follows we then attend to the ways clinicians navigated their improvement work through the  
218 various, sometimes conflicting, demands posed by the interplay of logics.

## 219 **Checklist as a stop and check**

220 Similarly to aviation where the idea of the checklist originated (Clay-Williams and Colligan 2015), the  
221 stop and check logic required clinicians to pause and check whether a set of interventions specified  
222 on the checklist form had been completed. As such, the checklist was designed to become an  
223 important tool to remind an individual – the clinician holding the boarding card in their hands – to  
224 check whether either they or colleagues had done what they were meant to. The guiding question

225 was “has this been done?”, “have we missed anything important?” in pre-operative assessment and  
226 decision-making:

227           It’s all about optimising the physiology of a patient going for laparotomy. [...] So [here we  
228           have] highest early warning score in the last six hours, [then] systemic inflammatory  
229           response syndrome, so this is the patient tachycardia, what’s their white count et cetera. [...] Antibiotics,  
230           have they been given yet, is the patient consented, cross-matched, evidence of  
231           coagulopathy, and then there’ll be a predicted mortality. (Consultant surgeon, Hospital 2)

232 The positive argument for using the checklist to stop and check bore the imprint of Gawande and the  
233 ‘human factors’ community about how human fallibilities (e.g. cognitive capacity, memory) in  
234 pressurised, complex organisations can give rise to ‘non-compliance’. The EPOCH improvement leads  
235 promoted checklists as a means of managing complexity and, in doing so, translated these  
236 arguments into their local environments.

237           It may be that you forgot to take the temperature because you had other things on your  
238           mind, and so having the flowchart and the tick boxes, you just go “Oh, I haven’t ticked that  
239           box, what was that one, oh, that was the temperature one, oh, quickly do that.” (Consultant  
240           anaesthetist, Hospital 2)

241 The ‘temporality’ of the stop and check logic was thus looking back before the next clinical step  
242 could begin. Stopping and checking required that clinicians craft dedicated time and space for doing  
243 so. Local improvement teams introducing the boarding card followed the guidance and located this  
244 opportunity in the period immediately before a theatre was to be booked for operation. To support  
245 this pause of self-reflection and to ensure clinical interventions on the boarding card were given  
246 attention by clinicians, theatre booking systems in Hospital 2 were amended, and administrators and  
247 theatre coordinators were instructed not to book operations unless all interventions on the boarding  
248 card had been completed.

249 **Checklist as a prompt**

250 The second logic of the pre-operative checklist – checklist as a clinical prompt – also related to  
251 individual clinicians considering clinical interventions. Individually and as a bundle, all interventions  
252 on the boarding card made sense to clinicians who deemed them a good standard of care in high-  
253 risk emergency surgery. Still, for any individual patient, they may not have deployed every single  
254 intervention. The EPOCH trial aimed to reduce variation in care. To that end, the checklist was  
255 designed as a tool to instil sameness. Both “stop and check” and “clinical prompt” logics had a role in  
256 this effort – both prescribed actions to be taken by clinicians. Where they differed was temporality  
257 and rhythm. The stop and check logic operated retrospectively and required clinicians to slow down  
258 to recall and reflect, whereas as a prompt the checklist mainly called to action prospectively what  
259 might not otherwise happen.

260 I'm interested that [clinical interventions] are done. Ultimately we're interested that it's  
261 done. It would be a bonus if the checklist has actually been completed; but I think the  
262 checklist, from my point of view, is a prompt for people. (Research nurse, Hospital 2)

263 Some clinicians felt that the checklist as a prompt was there to provide guidance to junior doctors in  
264 particular. Others had in mind those providing cover on an early morning shift and those who may  
265 otherwise forget or resist taking specified clinical interventions.

266 Checklists are good, tick boxes are good, because when people are in a stressful situation or  
267 if they're tired or if there are lots of other pressures going on and they're being torn in lots  
268 of different directions to do lots of different jobs by lots of different people, that people  
269 don't perform well and checklists are a safety mechanism and can really help in that  
270 situation. (Consultant intensivist, Hospital 2)

271 Taken seriously, the checklist was meant to ensure a set of concerted clinical interventions took  
272 place every time, everywhere. As such it demanded *all* clinicians, irrespective of seniority, to be  
273 obedient in enacting all prescribed interventions deemed right and proper in pre-operative care.

274 The more we do it, the easier it will get, the more it becomes established into the fabric of  
275 what we do and the easier it will be. But I think in the early days mainly to use it as a prompt  
276 and then for the resistant cases we'll need to use a taser and then people will develop an  
277 aversion to tasers and will start to do it; even the more reluctant members will start to do it.

278 (Consultant anaesthetist, Hospital 2)

279 The ideal user of the checklist was therefore a clinician who subscribed to the call of quality and  
280 safety to eradicate variation in care. The checklist as prompt had no expiry date: it was not to be  
281 overridden by years of clinical experience or by established routinisation of actions.

282 [W]e all think we know better, we all think we know how to give an anaesthetic, but really,  
283 do we? There's nothing, there's no evidence to suggest that. All the evidence suggests [the  
284 need to] minimize variation in practice. And I think – essentially it's a checklist, isn't it, and  
285 that's [what] these things are doing. (Consultant in intensive care and anaesthetics, Hospital  
286 5)

287 Together with the logic of checking, prompts to action were framed as important and indispensable  
288 to everyday work even for the most experienced of clinicians, since no-one was deemed immune to  
289 the risk of errors and workarounds. When clinicians argued that the checklist helped in dealing with  
290 manifold pressures of the workplace, another echo of arguments from Gawande's *Manifesto* could  
291 be heard across improvement teams.

## 292 **Checklist as an audit tool**

293 Thirdly, improvement teams introduced the boarding card as an audit tool to monitor the  
294 implementation of the pre-operative bundle. As such they felt its format allowed for an easy

295 administration, collection and checking to provide information about compliance with newly rolled  
296 out processes. The compliance was in turn seen as a precondition of improved outcomes. Therefore,  
297 with respect to audit, the prime action associated with the checklist was recording. Where the stop-  
298 and-check asked clinicians to initiate a mental verification of their past actions and the prompt logic  
299 asked them to act, the audit logic required clinicians to write, tick, and record for the sake of a  
300 distant reader. Thus the beneficiary also changed. Recording for audit did not benefit the clinician  
301 and their immediate actions, but a third party who at some point might collect and audit the  
302 checklists.

303 The defining feature of the audit logic was the presumption of a close link between what was  
304 recorded and what had happened. As long as the checklists were filled in, clinical interventions listed  
305 on the boarding card were deemed actioned. Conversely, the improvement leads often repeated the  
306 assumption that 'what is not recorded has not happened'.

307           We've discussed this, and in my mind if the data is not there, it hasn't been done.

308           (Consultant anaesthetist, Hospital 2)

309 Outside the audit logic, clinicians were ready to problematize such an assumption as simplistic. They  
310 could readily recall how actions and recording of those actions were in fact spatially and temporally  
311 dissociated, and could take place independently of each other. Clinicians knew that at times, such as  
312 in situations of conflicting pressures, prescribed interventions were difficult to complete. Their  
313 experiences also suggested that, at other times, recording was implausible or even impossible.  
314 Practical dissociation between clinical actions and their recording for audit also meant that, at least  
315 in principle, action could take place even when the associated recording did not (or vice versa).

316           I did one [emergency laparotomy] recently. I realised that I still hadn't filled out the checklist  
317 form because the [patient] was about to die in front of me, so I didn't get the checklist done  
318 at the time. But I did it retrospectively [...] after theatre. (Consultant anaesthetist, Hospital 2)

319 Yet when acting within the audit logic, irrespective of their experience with the practical  
320 disentanglement between actions and recording, clinicians upheld the ideal of a tight coupling  
321 between the two. Only such insistence, tenable or not outside audit, rendered checking compliance  
322 through the means of the boarding card meaningful. It promised to inform the improvement team  
323 whether implementation was a success or a failure. Thus when a research nurse in Site 2 was asked  
324 to retrieve the boarding card forms for 17 emergency laparotomies and found that only seven had  
325 been completed, with only five in full, the local improvement team had a generalised sense of failed  
326 clinical *practice* (not just record-keeping).

327 The ease with which counting could be done was a valued quality of the checklist in its own right.  
328 Even though the improvement teams also used other more extensive performance measures to  
329 harness knowledge about instilling change in emergency surgery, the allure of auditability was  
330 strong among clinicians. They maintained praise of the boarding card as a very “auditable tool”,

331       Being a tick box, [the boarding card] is very easily auditable. Because we can send one of our  
332       med students away and say, “Count how many boxes have been ticked,” and we can plot  
333       them on the timeline. We can have a monthly return; put them on a timeline. And what I  
334       would love to see is mortality coming down as our intervention rate goes up. (Consultant in  
335       anaesthetics and critical care, Hospital 2)

336 In Site 5, the improvement team discussed whether the boarding card should be incorporated into  
337 an existing theatre booking form. In the discussion, one member of the team argued against  
338 burdening clinicians with yet another form, and for merging the checklist with the theatre booking  
339 form. However, the promise of quick and easy auditability won the argument, and the forms  
340 remained separate. This was because recording in the logic of audit was not regarded as  
341 burdensome; rather it was constructed as integral to care and a supposedly synergistic extension of  
342 the other logics of stop and check and prompt.

343 **Checklist as a clinical record**

344 On top of audit, some clinicians associated the emergency laparotomy checklist with another way of  
345 recording clinical activity. In complex organisational arrangements such as healthcare, clinical  
346 records have an indispensable role in decision-making, which often cannot proceed without having  
347 specific recorded information at hand (Berg and Bowker 1997). This enabling role in clinical decision-  
348 making was what distinguished clinical record from recording for audit. Although both logics  
349 involved practices of writing in order to share information with others, in audit these “others” were  
350 third parties auditing compliance. The checklist was also meant to be relevant to clinicians and the  
351 unfolding process of care there and then. In this respect, the boarding card was equipped to hold  
352 patient-specific, clinically relevant information, most importantly the P-POSSUM score calculating  
353 the risk of mortality and morbidity, across temporally and spatially separate teams.

354           There are possibly two or three registrars involved in seeing a patient at different times of  
355           the patient journey. And things can slip... (General surgery registrar, Hospital 2)

356 Holding such information (such as body temperature or levels of arterial lactate) would also  
357 reinforce the agency of the checklist: clinicians would be waiting for the records to inform their  
358 actions, and require less coercion to engage with the checklist.

359 Contrary to these hopes, it soon transpired that, of all four logics, the logic of clinical record was the  
360 least pronounced in the *use* of the boarding card. In an environment already populated by a plethora  
361 of other forms containing a spectrum of measures that circulated in and out of operating theatres,  
362 the boarding card as a record failed to interest clinicians. Although the checklist followed patients  
363 through theatres, most of its items were also being recorded elsewhere and thus seen as duplicate:  
364 for example, the calculated P-POSSUM score, which EPOCH leads understood as a key measure to  
365 inform decision-making pre-operatively, was recorded on the boarding card but also on the National  
366 Emergency Laparotomy Audit form which, unlike the checklist, was mandatory for clinicians to

367 complete and which sometimes even served as a reference point for clinicians – i.e. it also served as  
368 a clinical record, leaving this logic of the checklist redundant. As a result, no-one was really waiting  
369 for the checklist to inform their decision-making. When put to action in the wider infrastructure of  
370 records, the checklist ended up yielding comparatively little relevance to keep clinicians interested.  
371 As the boarding card failed to move from one pair of hands to another it practically weakened the  
372 logic of clinical record.

### 373 **Dealing with incoherence**

374 When the boarding card was introduced in participating sites, it was thought of as a singular entity  
375 able to perform several roles, from allowing clinicians to stop and check to serving as a clinical  
376 record. In practice, however, clinicians involved in the process of implementing the tool started to  
377 experience uncertainties when revising the tool for the purposes of audit. The materiality of the  
378 form, namely the way individual items on the form were formulated, sat well with some logics and  
379 created tensions with others. Within the logic of prompt, clinicians interacted with a sequence of  
380 reminders. As the boarding care conveyed “key words” referring to familiar clinical interventions,  
381 the exact wording of sentences was of lesser importance. For clinicians the checklist as a prompt  
382 simply read: ‘do the blood sugars’, ‘give antibiotics’, ‘consent the patient’ etc. Within the logic of  
383 audit, however, this was no longer the case and the wording of individual prompts gained gravity.  
384 Clinicians needed to read the whole sentences and consider more carefully what they meant rather  
385 than rely on key words understood as a reminder of good practice and a prompt to action.

386 Take the case of a specific item of the boarding card, ‘patient warming’. As a clinical prompt, it  
387 simply asked clinicians to remember that body temperature mattered and that it ought to be  
388 checked. Ideally it would be taken seriously by a knowledgeable and skilled clinician who would then  
389 determine a specific action based on their experience and clinical judgement. Compared to the  
390 checklist as a prompt, the logic of audit rendered the manoeuvring space for individual action  
391 narrower. Whereas a prompt could come in the form of a keyword which elucidated a range of

392 practical options, the wording of an audit question had a certain specificity built into it; and with it  
393 came prescriptiveness: the checklist rendered some clinical actions more permissible than others. A  
394 clinician used to the relative freedom of prompts, stemming from not being called upon to account  
395 for every word, could then become preoccupied with what practice was implied by the wording, and  
396 how it related to their and others actions.

397 [It says,] “Has active patient warming been undertaken?” Well, no it hasn’t. So you put ‘no’  
398 in and it scores badly on the interventions. But, actually, it hasn’t been undertaken because  
399 the temperature was 39 degrees [Celsius] and you’re not going to warm someone who is  
400 boiling hot. So [it should really read], “Has avoidance of hypothermia been considered?”  
401 [That would mean], they’re cold, let’s do something about it. But yes it’s been considered  
402 but they’re hot so we’re not doing anything about it, but it’s still being considered.

403 (Consultant anaesthetist, Hospital 2)

404 A similar tension was observed in the case of other items on the checklist such as glucose  
405 management and administering antibiotics. Each time, the tension manifested itself in terms of  
406 specificity and permissiveness of clinical actions and triggered a realisation that prompts were also  
407 audit questions. This in turn could trigger critical reflection resulting in an intent to redesign the  
408 checklist in order to resolve the tension and re-entangle the materiality of the checklist with a range  
409 of logics.

410 Glucose monitoring, we should be doing that for everyone. But it says, “Have you done  
411 blood glucose monitoring? ‘Yes/No’.” We should do it for everyone. So that’s an easier one  
412 to ask. [But] to do the low tidal volume, protective ventilation you need a ventilator that’s  
413 quite a little bit more intuitive than a lot of the basic ventilators. You can do it, but it may be  
414 more difficult and in difficult patients you may spend all your time fiddling with the  
415 ventilator. So all we’re saying is “Has it been attempted?” and that gets us round the fudge  
416 of having a ventilator that’s not up to purpose. (Consultant anaesthetist, Hospital 2)

417 Not all items of the boarding card were seen by clinicians as problematic; some questions, such as  
418 those related to calculating a mortality risk score, consenting a patient and recording an early  
419 warning score, were deemed to have universality and context specificity balanced – they were to be  
420 actioned for all patients regardless of the specifics of the case. But in many cases, the need for an  
421 easily completed form that could be audited and for an aide that would prompt action and checking  
422 by the individual clinician were in tension.

## 423 **Discussion**

424 This study draws upon STS sensibilities to contribute to the existing debate about the checklist and  
425 its role in healthcare improvement. It follows Davina Allen's (2012, 2017) call for examining the  
426 mundane technologies used in organising healthcare as socio-material entanglements, and her  
427 rendition of the notion of affordances through which the technologies interpellate clinicians. In the  
428 case of the EPOCH 'boarding card', these interpellations were observed to be less deterministic than  
429 implied by the notion of a simple checklist and, at the same time, exercised more gravity than  
430 suggested by critics who may tend to focus on the social shaping of clinical actions and tools. Rather  
431 than a singularised simple tool, this study identified four different logics of the checklist, each calling  
432 upon clinicians to initiate certain actions: the checklist as a stop and check required only minimum  
433 recording, as it mainly asked clinicians to recount clinical steps so far; the checklist as a prompt  
434 required clinicians to activate interventions listed as part of a clinical pathway; the checklist as an  
435 audit tool expected them to provide ticks and numbers under all listed items; and the checklist as a  
436 clinical record sought (though largely failed) to prompt them to write down clinically relevant  
437 information, e.g. the mortality risk score, for colleagues to read and act upon.

438 The tool coupled different logics, yet the multiplicity did not necessarily imply tensions. For example,  
439 we did not detect tensions between the checklist as a stop and check tool and a prompt; the  
440 materiality of the form in its specific format allowed both to be acted upon: one was prospective,  
441 the other retrospective, and their temporalities complemented rather than conflicted with each

442 other. The ill-fated logic of clinical record was rendered irrelevant not by other logics but by other  
443 recording devices, such as the National Emergency Laparotomy Audit form, the anaesthetic form  
444 and the existing theatre booking form, circulating in perioperative care. Practical use or non-use  
445 derived not just from the interaction of logics with each other, however; they arose from  
446 interactions with clinicians and the ways the tool was intertwined with the wider textures of  
447 healthcare. In this respect, apart from circulation of forms, we saw improvement teams crafting an  
448 architecture of support for the checklist as a stop and check by entrusting theatre administrators  
449 with the powers not to book operations unless all items on the checklist had been attended to. We  
450 also saw how a specific gravity was associated with the checklist as an audit tool due to well-  
451 established “audit cultures” (Strathern 2000) within healthcare which affected what the  
452 improvement teams wanted the checklist to tell them about compliance and what format the  
453 checklist might take. Most broadly, we saw the tool connected to (and formed by) the dreams of  
454 quality improvement as a specific approach to realising healthcare, which animated clinicians’ will to  
455 engage with the boarding card through a promise of improved outcomes further down the line.

456 Moving back to the material specificity of the boarding card, particular tensions were observed as a  
457 relational effect of the format of the checklist and its wording and the in/ability of clinicians to act.  
458 We noticed a tension between the logics of prompt and audit. What seemed a simple and obvious  
459 form of wording for one purpose could complicate the checklist’s use according to the other. As part  
460 of the checklist’s composition, the logic of prompt allowed for certain flexibility, in contrast to the  
461 closed format of audit questions which impacted on how they could be answered and what the  
462 answers meant. In audit, all words on the form started to matter – and the wording could belie the  
463 checklist’s assumed utility and ease of use. In audit specifically, the prime action demanded by the  
464 checklist was recording for a third party rather than performing a clinical action there and then. This  
465 postponed use of the checklist in audit further complicated clinicians’ interaction with the tool as it  
466 brought into play questions of evaluation of their performance, and of the improvement project as a  
467 whole. Yet even when logics conflicted, it did not need to pose an irresolvable problem. As Allen

468 notes, people interacting with technologies tend to “find ways of managing the constraints and the  
469 possibilities that emerge from a technology’s affordance” (Allen 2017: 3). In this respect, we  
470 witnessed clinicians tinkering with the design of the boarding card – their strategy was to insert the  
471 notion of ‘consideration’ – “has X been considered” rather than “has X been done” – which would  
472 allow clinicians to assert clinical judgement and render the checklist applicable as an audit tool at the  
473 same time. It is worth noting that the ability to redesign the checklist was specific to the innovative  
474 nature of the trial. As such it was conditional and locally crafted. Had the boarding card been rolled  
475 out as part of a different initiative with a standardised format, clinicians would need to deploy  
476 different coping strategies, such as workarounds, rather than direct re-design.

477 Such incoherence, as others in STS literature have argued (Law 2002), was not in principle a  
478 problem. On the contrary, it was key to resolving tensions in situations when responding to some  
479 logics of the checklist led to a struggle to follow others. It also closely related to the  
480 acknowledgement that the checklist required adaptation in dynamic and divergent clinical settings,  
481 rather than being a fixed untouchable simply to be. This implied recognition that the very simplicity  
482 of the ‘simple checklist’ could, ironically, cause complications: what was simple for one logic needed  
483 to be carefully unravelled if the checklist was to work in another. In more general terms, success or  
484 failure of the checklist was not only in the hands of clinicians; it was also in the hands of the tools –  
485 their properties and affordances. In this respect our study suggests to conceptualise the potential of  
486 checklists in such way to avoid the all too familiar oscillation between welcoming checklists as simple  
487 and powerful tools and the surprise when checklists turn out to be less helpful than anticipated in  
488 making change happen. The key is in supporting settings and arrangements in which incoherences  
489 inscribed into tools can be locally negotiated. This includes asserting the role of various human  
490 intentions in moulding the materiality, and hence the affordances, of the checklist in a way that  
491 anticipates its use, its interaction with other actants, and the interpellations that might follow – and  
492 thus accommodates and reconciles divergent intended functions as far as possible. This is not to  
493 argue that such devices can be ‘scripted’ through meticulous design such that emergent agency is

494 designed out (cf. Oudshoorn and Pinch 2003), but it is to suggest that through iterative development  
495 based on practical experience, better checklists—and better approaches to improvement—are  
496 possible.

## 497 **Conclusion**

498 Previous sociological studies highlight social contexts as key to successful use of the checklist in  
499 healthcare improvement. Our STS-informed study suggests that the checklist as a mundane tool  
500 comes equipped with affordances that mediate rather than determine entanglements of people and  
501 things in organising healthcare. Moreover, rather than a seemingly simple tool with a singularised  
502 set of affordances, we identified four logics, each interpellating clinicians to specific actions. When  
503 given the opportunity, clinicians managed constraints and negotiated conflicts. In this respect, our  
504 study highlights the potential for improvement initiatives to nourish formative reflexivity about the  
505 construction of checklists as part of the wider infrastructures of improvement.

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613 **Figures and Tables**

614 **Figure 1:** The prototypical emergency surgery ‘boarding card’. *Source:* Richards et al. 2016

Royal United Hospital Bath **NHS** EMERGENCY  
NHS trust

## LAPAROTOMY BOARDING CARD

*Attach addressograph label*

RUH no.: \_\_\_\_\_ NHS no.: \_\_\_\_\_

Patient name: \_\_\_\_\_

Address: \_\_\_\_\_

D.o.B.: \_\_\_\_\_ Age: \_\_\_\_\_

Is MEWS >3? \_\_\_\_\_ Y / N

If MEWS >3, have Outreach been involved? Y / N / n/a

Evidence of SIRS\*? \_\_\_\_\_ Y / N

Blood cultures taken? \_\_\_\_\_ Y / N Given at [nursing staff]:

Fluids prescribed†? \_\_\_\_\_ Y / N \_\_\_\_\_

Analgesia prescribed? \_\_\_\_\_ Y / N \_\_\_\_\_

Antibiotics prescribed? \_\_\_\_\_ Y / N \_\_\_\_\_

Arterial lactate: \_\_\_\_\_ mmol/L

Decision to operate: Date \_\_\_/\_\_\_/\_\_\_ Time \_\_\_:\_\_\_ hrs

NCEPOD class:      A      B      C      D

Case booked at:      Date \_\_\_/\_\_\_/\_\_\_ Time \_\_\_:\_\_\_ hrs

P-POSSUM scores‡: Mortality \_\_\_\_\_ % Morbidity \_\_\_\_\_ %

Peritoneal soiling suspected? Y / N

**If P-POSSUM mortality exceeds 80%, case must be discussed at Consultant level between Surgery & Anaesthesia/ICU**

Differential diagnosis \_\_\_\_\_

Procedure planned \_\_\_\_\_

**Latest acceptable knife-to-skin time (= booking +6 hours)** \_\_\_\_\_ : \_\_\_\_\_ hrs

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**Completed by:** \_\_\_\_\_

Grade \_\_\_\_\_

Bleep \_\_\_\_\_

**ACTION CARD** for the Doctor booking case – these tasks are YOUR responsibility!

- ✓ NOTIFY OUTREACH OR ITU RESIDENT IF PATIENT EWS GREATER THAN 3
- ✓ †PRESCRIBE AND GIVE ANALGESIA AND FLUIDS (maintenance 1-1.5mls/kg/hr Hartmann’s solution, if systolic <90mmHg give 250mls boluses of Hartmann’s solution repeated at 15 min intervals)
- ✓ PRESCRIBE AND GIVE ANTIBIOTICS IF SEPTIC and ESTABLISH IF PATIENT HAS SIRS
- ✓ \*SIRS criteria: any 2 of: Respiratory rate >20 or pCO2 < 4.3kPa, temperature < 36C or > 38C, heart rate > 90bpm, WCC < 4 or > 12
- ✓ MEASURE LACTATE AND TAKE BLOOD CULTURES
- ✓ ‡CALCULATE P-POSSUM PREDICTED MORTALITY & MORBIDITY (<http://www.riskprediction.org.uk> – or via link on RUH Intranet Desktop Dashboard)
- ✓ COMPLETE THE BOOKING CARD ABOVE CARD AND ATTACH TO EMERGENCY LAPAROTOMY PATHWAY

This laparotomy was booked at \_\_\_\_\_:\_\_\_\_\_ hrs and needs to be performed by \_\_\_\_\_:\_\_\_\_\_ hrs (booking plus 6 hours).

If a CT is awaited notify the radiology department that this patient has been booked for an Emergency Laparotomy and the examination needs to be done URGENTLY.

By \_\_\_\_\_ hrs (booking plus 4 hours) directly notify the Consultant General Surgeon on call if the patient has not yet been sent for or if radiology has not been reported.

615

616

617 **Table 1:** Four logics of the checklist

Checklist logic	Beneficiary of action	Aim	Temporality	Speed and rhythm of action	Record-keeping
<b>Stop and check</b>	The clinician	To ensure all items of the list completed and standardise practice	Retrospective	Slow down and check	Not required

<b>Prompt</b>	The clinician	To support decision making and standardise practice	Prospective	Take action which otherwise may not happen	Not required
<b>Audit</b>	Improvement team (third party)	To show whether prescribed interventions took place	Retrospective	After the act - find time to record, if only as a tick in a box	Required
<b>Clinical record</b>	Clinicians attending to the patient at next steps	To record patient attributes for clinical decision making	Retrospective / Prospective	Write As You Go approach similar to other clinical records to enable clinical steps further on a pathway	Required