

# Driving Resumption After Critical Illness: A Survey and Thematic Analysis of Patient Experience and Process

Joel Meyer (✉ [Joel.Meyer@gstt.nhs.uk](mailto:Joel.Meyer@gstt.nhs.uk))

St. Thomas' NHS Foundation Trust, London <https://orcid.org/0000-0003-3303-3514>

**Natalie Pattison**

University of Hertfordshire

**Chloe Apps**

Guy's and St Thomas' NHS Foundation Trust <https://orcid.org/0000-0002-4855-4243>

**Melanie Gager**

Royal Berkshire NHS Foundation Trust

**Carl Waldmann**

Royal Berkshire NHS Foundation Trust

---

## Research

**Keywords:** Driving, Critical illness, Critical Care, Recovery, Intensive care

**Posted Date:** October 9th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-86238/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

1 Driving resumption after critical illness: A survey and thematic analysis of patient experience and  
2 process

3 Meyer, J. Pattison, N. Apps, C. Gager, M. Waldmann, C.

4 Joel Meyer, PhD <sup>1</sup>, Natalie Pattison, PhD <sup>2,3,4</sup>, Chloe Apps, MSc <sup>1,5</sup>, Melanie Gager, MSc <sup>6</sup>, Carl  
5 Waldmann, PhD <sup>6</sup>

6

7 <sup>1</sup>Critical Care Research Group, Guy's and St. Thomas' NHS Foundation Trust, London, United  
8 Kingdom.

9 <sup>2</sup>University of Hertfordshire, Hatfield, Hertfordshire, United Kingdom

10 <sup>3</sup>East & North Herts NHS Trust, Stevenage, United Kingdom

11 <sup>4</sup>Florence Nightingale Foundation, London, United Kingdom

12 <sup>5</sup>GKT School of Medical Education, Faculty of Life Sciences and Medicine, King's College London,  
13 London, United Kingdom

14 <sup>6</sup>Royal Berkshire NHS Foundation Trust, Reading, United Kingdom

15

16 **Corresponding Author:**

17 Joel Meyer, Critical Care, St. Thomas' Hospital, Westminster Bridge Rd, London SE1 7EH, United  
18 Kingdom.

19 Email: Joel.Meyer@gstt.nhs.uk

20

21

22 **ORCID**

23 **Joel Meyer:** <https://orcid.org/0000-0003-3303-3514>

24 **Natalie Pattison:** <https://orcid.org/0000-0002-6771-8733>

25 **Chloe Apps:** <https://orcid.org/0000-0002-4855-4243>

26 **Melanie Gager:** <https://orchid.org/0000-0001-5394-9314>

27 **Carl Waldmann:** <https://orcid.org/0000-0001-6643-5072>

28 **Abstract**

29 *Background:* Critical care sequelae are common in survivors of critical illness. Physical, psychological  
30 and cognitive impairments can affect quality of life for years after the original insult. Driving is an  
31 advanced task reliant on complex physical and cognitive functioning. Driving represents a positive  
32 recovery milestone. Little is currently known about the driving habits of critical care survivors. The  
33 aim of this study was to explore the driving practices of individuals after critical illness. *Methods:* A  
34 purpose-designed questionnaire was distributed to critical care recovery clinic attendees at the 1-  
35 year post hospital discharge time point. *Results:* A response rate of 90% was achieved. All  
36 respondents declared their intention to return driving. 68% had resumed driving by 3 months, 77%  
37 by 6 months and less than 80% by 1 year. The median interval (range) between critical care  
38 discharge and resumption of driving was 8 weeks (1 to 52 weeks). Psychological, physical and  
39 cognitive barriers were cited by respondents as barriers to driving resumption. Eight themes around  
40 driving resumption were identified through thematic framework content analysis; These were  
41 Confidence; Emotional strength/nervousness and anxiety; Concentration; Weakness and fatigue;  
42 Physical ability; Intrinsic motivation; Information; Timescales. *Conclusion:* This study demonstrates  
43 that resumption of driving following critical illness is substantially delayed. Qualitative analysis  
44 identified potentially modifiable barriers to driving resumption.

45 *Keywords:* *Driving, Critical illness, Critical Care, Recovery, Intensive care*

46

47 **Background**

48 Physical, psychological and cognitive impairments are common in survivors of critical illness [1].  
49 These impairments, collectively known as Post-Intensive Care Syndrome (PICS), diminish quality of  
50 life and are burdensome for patients, carers and society [2, 3]. An increasing awareness and

51 recognition of PICS has prompted commitments to enhance multidisciplinary aftercare with the  
52 overall goal of improving patient-centred outcomes and health-related quality of life.

53 Resumption of driving represents a crucial recovery milestone. For those patients who are licence  
54 holders, return to driving may promote independence and enable other determinants of recovery  
55 such as social activity and return to employment. Driving is, however, a complex task necessitating  
56 intact cognition (executive skills, visual perception, attention, memory and comprehension), physical  
57 ability (strength, sensation, coordination and reaction speed) as well as emotional preparedness.  
58 These elements may all be affected after critical illness.

59 Currently, continued driving eligibility is determined by medical diagnosis rather than capability to  
60 drive. National and international guidance regarding fitness to drive does not address the post  
61 intensive care period. Thus, healthcare professionals and individuals lack consistent advice as to  
62 when driving resumption can occur. Individuals may self-determine suitability to drive without  
63 professional guidance. Premature resumption carries risks to both self and other road users.  
64 Conversely, return to driving should not be arbitrarily prohibited or unduly prolonged. Enabling  
65 return to driving is important as it allows independence and return to everyday activities. Very little  
66 evidence exists to guide clinicians and patients following critical illness. Wolfe and Lehouckey (2016)  
67 suggest clinicians should take into account functional ability and medical history, including  
68 conditions that may impair ability to drive and react, and correlate these factors with the risk for  
69 driving accidents [4].

70 Presently, little is known about when, or if, patients return to driving after critical illness and what  
71 barriers patients experience in relation to this activity. The aim of this study was to explore and gain  
72 insight into driving practices of individuals following critical illness.

73

74

75 **Methods**

76 *Design*

77 An anonymised, cross-sectional, questionnaire was used to ascertain both quantitative (age, gender,  
78 driving status, time course of driving resumption) and qualitative experiential aspects of driving  
79 resumption (via open-ended questions). The primary outcome was the prevalence of driving  
80 resumption at 3 months following ICU discharge.

81

82 *Setting*

83 This study was undertaken in the adult critical care department of a large UK District General  
84 Hospital with 18 beds, approximately 800 admissions per year, ICU mortality of 18.9%, and mixed  
85 medical/surgical case mix.

86

87 *Respondents*

88 Driving licence-holding adults having undergone 4 or more days mechanical ventilation attending the  
89 Rehabilitation After Critical Illness outpatient clinic approximately 3, 6 and 12 months after hospital  
90 discharge were eligible to participate.

91 Fifty consecutive clinic attendees between 2014 and 2015 were invited to complete a short,  
92 anonymised questionnaire to solicit quantitative (timing) and qualitative data (open-ended textual  
93 responses) about driving resumption. The study was confirmed as a service evaluation that did not  
94 require ethical approval (UK Health Research Authority, [http://www.hra.nhs.uk/research-](http://www.hra.nhs.uk/research-community/before-you-apply/determine-whether-your-study-is-research/)  
95 [community/before-you-apply/determine-whether-your-study-is-research/](http://www.hra.nhs.uk/research-community/before-you-apply/determine-whether-your-study-is-research/)). Informed consent was  
96 sought from all respondents.

97

98 *Materials and procedure*

99 Survey questions were devised by an iterative process and were considered for content and face  
100 validity by two researchers (JM and CW). Five questions were included in the final questionnaire  
101 (listed in Additional File 1). Respondents could opt to complete the handwritten paper survey whilst  
102 in clinic or alternatively in their own time by postal return. Respondents received assurance that any  
103 ongoing treatment or care would not be affected by participating in the survey.

104

105 *Data Analysis*

106 Quantitative data were of the nominal/ordinal form and analysed using SPSS Version 25 using  
107 descriptive frequency analyses (percentages). Continuous data were reported as a median and  
108 range. The Kaplan Meier method was used to analyse time-to-event i.e. days from ICU discharge to  
109 driving resumption.

110 Qualitative textual data from the open-ended questions were analysed by thematic framework  
111 analysis [5]. Themes for the framework were derived from the data, with the framework refined as  
112 data analysis took place. Data were examined by two researchers to ensure consensus was reached  
113 across each theme and how comments were attributed under those themes. These two researchers  
114 transcribed and analysed the handwritten survey data independently before agreeing the key  
115 themes for the framework analysis. This was then applied across all the data. A third researcher  
116 independently reviewed the raw data and choice of themes in the framework to increase robustness  
117 and reduce potential bias.

118

119 **Results**

120 45 out of 50 respondents completed the questionnaire (90% response rate). The median age of  
121 respondents was 60 years (range 27-82), and 50% female., All respondents possessed a valid driving

122 licence and declared an intention to resume driving. The surveyed population was reflective of the  
123 diverse critical care unit admission source: emergency admission 39%, post-operative admission  
124 25%, medical inpatient ward admission 29%, other 7%.

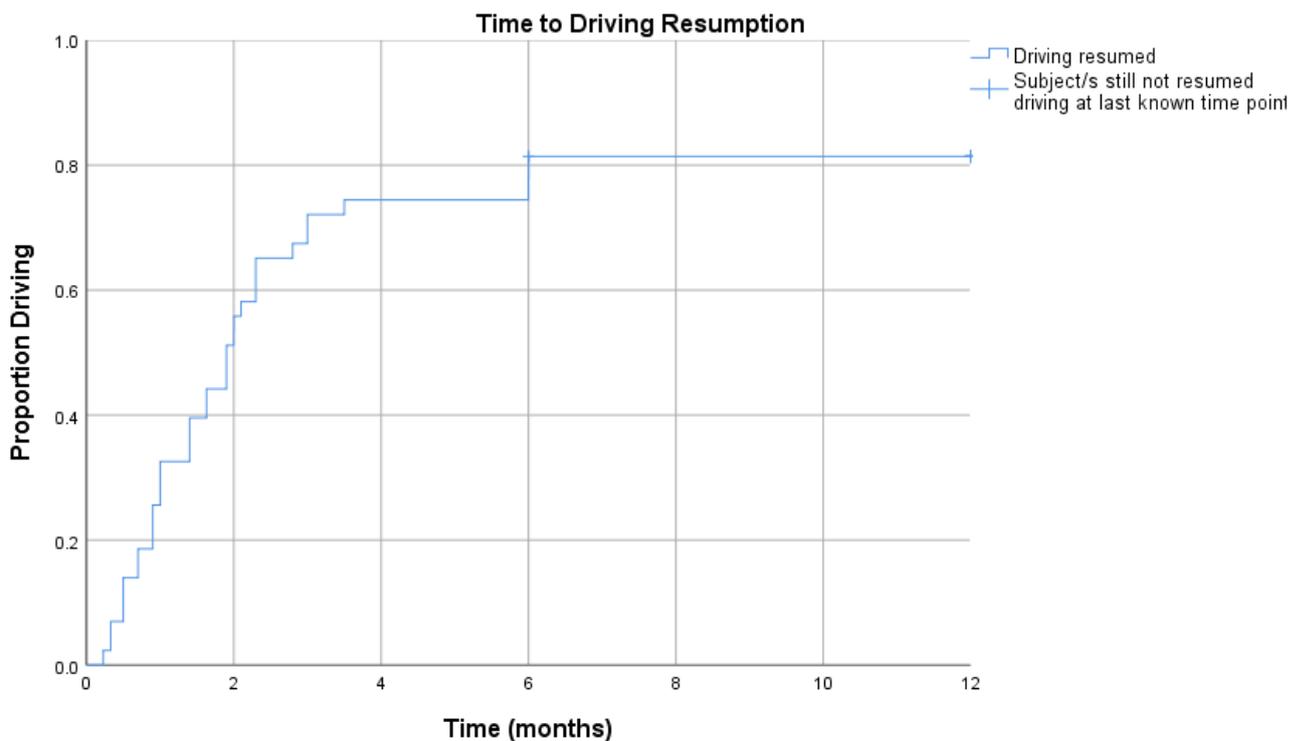
125 The primary outcome, the proportion of respondents who had resumed driving by the 3-month  
126 time-point after ICU discharge, was 68%. By the 6-month time-point the proportion was 77%.

127 The median interval between ICU discharge and resumption of driving was 8 weeks. The time period  
128 for resumption was markedly variable ranging from 1 to 52 weeks post ICU discharge (Figure 1).

129 Over 20% had not resumed driving by the 1-year time-point.

130

131



132

133 **Figure 1** Kaplan-Meier curve time to driving resumption after ICU discharge

134

135 36 out of the 45 respondents provided information about the advice they received regarding driving  
 136 resumption (Table 1). 22% did not receive any advice. Of the 78% that did, the GP was the most  
 137 commonly cited source for information (22%). DVLA and specialist consultants were cited by 11% of  
 138 respondents. Other sources were nursing staff (6%), the Rehabilitation After Critical Illness clinic  
 139 (3%) and insurance companies (3%). One respondent had undertaken a 'return to driving' course.  
 140 19% of respondents reported that ability to perform an emergency stop was a key factor  
 141 determining whether, or not, to resume driving.

142

143 Table 1: Sources of advice accessed by respondents

Sources of advice	No: of respondents
Did not seek advice	8
GP	8
DVLA	4
Specialist	4
Nurse	2
Recovery After Critical Illness clinic	1
Insurance	1
Return to driving course	1
Emergency stop	7

144

145

146 Qualitative analysis

147 Eight principal themes regarding driving resumption were identified from the framework analysis  
 148 (Table 2). These were; *Confidence; Emotional strength/nervousness and anxiety; Concentration;*  
 149 *Weakness and fatigue; Physical ability; Intrinsic motivation; Information; Timescales.*

150

151 Confidence

152 Lack of confidence determined how and when people returned to driving. Various strategies were  
153 used to mitigate against this, including having accompanied practice. Some respondents suggested  
154 'driving buddies' and with many advocating local drives first. Confidence was reported to increase  
155 once driving had been attempted and, in most cases, helped contribute to an overall sense of  
156 recovery.

157 *"... started with short trips of less than 1 mile, which gradually got longer. Accompanied*  
158 *practice, a 'driving buddy' was useful for confidence"* (Respondent 3)

159 *"I did a test drive to check spatial awareness etc.."* (Respondent 8)

160

161 Emotional strength/nervousness and anxiety

162 Nervousness was cited as a factor related to confidence;

163 *"I found it stressful at first"* (Respondent 10)

164 *"I didn't want to rush and put my family in danger"* (Respondent 5)

165 One respondent mentioned developing anger when driving highlighting emotional lability as a  
166 feature in driving ability.

167

168 Concentration

169 Feeling muddled, mentally unprepared and reduced concentration were reported and related to  
170 slower response times and decreased mental alertness. This theme also related to spatial

171 awareness, and one driver reported having a minor accident on their first drive since discharge.

172 Respondents varied in their self-awareness of their mental capacity to drive.

173 *“... things move too fast after a long period of not driving”* (Respondent 36)

174 *“(I needed to) be mentally ready; I can’t do long journeys – am tired and have no*

175 *concentration”* (Respondent 13)

176

177 Weakness and Fatigue

178 Weakness and fatigue were cited by respondents and these underpinned other themes.

179 *“Too tired initially; Strength began to return after several weeks. Even after 2 months I’m still*

180 *too tired to drive more than 1 hour”* (Respondent 2)

181 *“Accompaniment was helpful if I got too tired... (or I was) concerned about fatigue”*

182 (Respondent 3)

183

184 Physical Ability

185 The physical ability to drive and perform certain driving functions, such as emergency stops, was a

186 determining factor in driving resumption. For some respondents this aspect prevented driving for

187 several months.

188 *“I waited until legs felt strong....able to use brake in emergency”* (Respondent 6)

189 *“I was physically exhausted at first. I had no shoulder or ankle flexibility”* (Respondent 23)

190 This also linked into advice and the suggestion that physiotherapy input in returning to drive would

191 be useful.

192

193 Intrinsic Motivation

194 Intrinsic motivation seemed to be a significant factor for many respondents. Self-motivation is  
195 important in resuming normal activities and return to driving was used as a marker and milestone of  
196 recovery by respondents. Driving appeared to be a defining activity in people's recovery and their  
197 sense of self-worth.

198 *"... (driving is) important for 'returning to normal'"* (Respondent 16)

199 *"Desire to get my independence back"* (Respondent 23)

200

201 Information

202 The source of information accessed by individuals about driving following critical illness was highly  
203 variable. Respondents reported that advice from GPs often focused on physical ability, and in  
204 particular, ability to undertake an emergency stop was commonly used as a proxy for readiness to  
205 drive. However mental and cognitive ability were not interrogated.

206 *"Asked doctor as wanted to be sure; doctor advised it was okay if I could do an emergency  
207 stop"* (Respondent 9)

208 *"No guidance - doctor said 'when I felt ready'"* (Respondent 16)

209

210 Timescales

211 Timescales for those who returned to driving varied significantly, with feelings of being 'ready' most  
212 commonly cited by respondents, thus suggesting a need for mental preparedness.

213 *"(it has) taken 18 months to feel I could drive safely"* (Respondent 14)

214 *"... ICU stay was more than 1 month; I drove 1 week after discharge"* (Respondent 8)

215

216 Respondent-generated ideas to assist with driving resumption included driving re-tests, time with  
217 driving instructors to build confidence and motorway driving courses. Graded exposure to driving  
218 was a recurring theme, with many people initially 'testing' their ability to drive safely by undertaking  
219 short distance journeys. Clear accessible guidance after critical illness was advocated by  
220 respondents.

221

## 222 **Discussion**

223 This single centre study elicited the incidence, time-course and experience of driving resumption  
224 among 45 adult critical illness survivors. The findings highlight that driving resumption is often  
225 delayed in critical care survivors with less than 80% returning to drive one-year post discharge in our  
226 study findings. Many individuals rely on driving as a means of accessing work and social support,  
227 especially in rural areas and communities. Approximately one million people in the UK and over  
228 three million people in the US are primarily employed as drivers or are required to drive as part of  
229 their job, reflecting the importance of driving after critical illness to the economy as well as  
230 individual financial stability [6, 7].

231 Driving enables resumption of other important activities alongside work. Critical illness survivors  
232 often have on-going health requirements and for ease of access a vehicle is frequently required.  
233 Accessing hobbies and leisure pursuits are vital for enhancing quality of life [8]. Driving enables  
234 parental and carer responsibilities often required of individuals in this demographic. As noted in our  
235 study, driving was a defining activity in people's recovery and their sense of self-worth. This echoes  
236 findings from previous research highlighting the desire to regain independence following critical  
237 illness [9].

238 An unnecessary delay in driving resumption could impact the mental health of these individuals,  
239 further impeding recovery. Isolation and depression have been noted in older adults who have  
240 experienced a similar loss of independence [10-13]. Commentary from individuals in the public  
241 domain describe how in old age the car begins to represent life with feelings of freedom and  
242 normality being restored, even if only temporarily. The nature of not being able to drive represents  
243 an unwelcome agonising change [14]. Frailty associated with critical care survivorship may mean  
244 that individuals of a lower age demographic may entertain similar thoughts and feelings.

245 Numerous barriers to driving resumption were cited by respondents. Lack of confidence was a  
246 highlighted factor. Respondents in this study often cited accompanied and local drives to rebuild  
247 confidence and enable return to driving. Only one respondent underwent a return to driving course,  
248 but this may be an avenue for survivors to explore to enable safe and timely resumption of this  
249 activity.

250 There is a clinical responsibility too that needs to be considered. From whom, and how, these  
251 survivors gain their information about driving resumption is likely to be highly variable. Clinicians  
252 need to consider the cognitive, and especially the executive functioning level, alongside the  
253 functional ability, which is often the primary focus. Medications used to support critical illness  
254 recovery, may indeed impair ability to drive. A comprehensive approach to assessment is required,  
255 and in cases that are difficult to determine ability in the cognitive domain, a further  
256 neuropsychiatric/psychological assessment may be needed [4]. Ability to perform an emergency  
257 stop is not included in any guidance or standards, however from our survey it appears to be used as  
258 a proxy by healthcare professionals and patients in determining readiness to resume driving.

259 To our knowledge this is the first published study to explore the principal themes and metrics  
260 specific to driving after critical illness. Limitations of our study include the single-centre methodology  
261 which may not reflect the UK-wide or global picture. Clinical data about type/severity of critical

262 illness were not collected. Strengths of our study include the high response rate and the wealth of  
263 qualitative data ascertained relative to survey length.

264

## 265 **Conclusion**

266 Inconsistency of information received by respondents about driving resumption after critical illness  
267 in this study reflects lack of published guidance. Although the deleterious effects of a critical care  
268 stay are well documented [15] research about the impact these have on subsequent driving ability is  
269 lacking. Reducing avoidable delay to driving should be viewed as a low-cost high impact intervention  
270 to enhance health related quality of life. Further research is needed to understand the  
271 epidemiology, enablers and barriers to driving in this population.

272

## 273 **List of abbreviations**

274 PICS – Post-intensive care syndrome

275

Table 2: Evidence of themes

Themes	Number of comments made	Sample comments
Timescales	40	Respondent 1 - Female, 68: <i>"Approx. 3 months (1st time)"</i> Respondent 29 – Male, 60: <i>"At least 10 weeks"</i>
Information	34	Respondent 8 - Male, 75: <i>"Asked ward doctor (concerned re: medication side effects); advised if could brake, okay"</i> Respondent 23 - Female, 36: <i>"Discussed with work and GP; GP advised against it at first. Course arranged via work. No information given from hospital (how/when/legalities)."</i>
Physical Ability	20	Respondent 5 - Male, 34: <i>"Not strong enough at first; waited until gained some weight"</i> Respondent 9 – Female, 31: <i>"Hard work in arms; waited until I could do an emergency stop; had an open wound (covered) – waited until it didn't hurt"</i>
Confidence	26	Respondent 21 – Male, 76: <i>"Confidence an important factor (lack of) after long hospital stay"</i> Respondent 42 - Male, 64: <i>"Apprehensive at first; start/ed when confident in self"</i>
Intrinsic motivation	24	Respondent 13 – Female, 38: <i>"Need to be mentally 'ready'"</i>

		Respondent 16 – Male, 66: <i>“Important for ‘return to normal’”</i>
Emotional Strength/ Nervousness and Anxiety	15	Respondent 15 – Female, 72: <i>“Felt so vulnerable (so waited longer than advised)”</i> Respondent 19 - Female, 55: <i>“Wanted to return to being the person I was before all this trauma”</i>
Concentration	11	Respondent 12 – Female, 75: <i>“Extremely muddled after discharge; more alert now”</i> Respondent 36 - Male, 61: <i>“Mental ability problem; information processing; things move too fast after a long period of not driving”</i>
Weakness/Fatigue	7	Respondent 7 – Female, 44: <i>“Needed to feel stronger (for long journeys)”</i> Respondent 37 – Male, 71: <i>“Felt weak and listless with no energy and not until 5/6 weeks that felt able”</i>

## **Declarations**

### **Ethics approval**

The study was confirmed as a service evaluation that did not require ethical approval (UK Health Research Authority, <http://www.hra.nhs.uk/research-community/before-you-apply/determine-whether-your-study-is-research/>).

### **Consent to participate**

Informed consent was obtained from all individual respondents included in the study.

### **Consent for publication**

Not applicable

### **Availability of data and material**

The survey data that support the findings of this study are available from the corresponding author, (JM), upon reasonable request.

### **Competing interests**

The author(s) declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

**Funding**

The author(s) received no financial support for the research, authorship, and/or publication of this article.

**Authors contributions**

JM, CW, NP and MG were responsible for study conception and design. CA and JM were responsible for quantitative data analysis and interpretation. NP and JM were responsible for qualitative data analysis and interpretation. JM and CA prepared the manuscript. All authors contributed to manuscript revision and approved the final version for submission. JM acts as the guarantor for the intellectual integrity of the data.

**Acknowledgements**

Not applicable

## References

1. Connolly, B., et al., *Physical rehabilitation interventions for adult patients during critical illness: an overview of systematic reviews*. Thorax, 2016. **71**(10): p. 881-90.
2. Cuthbertson, B.H., et al., *Quality of life in the five years after intensive care: a cohort study*. Critical care (London, England), 2010. **14**(1): p. R6-R6.
3. Herridge, M.S., et al., *Functional Disability 5 Years after Acute Respiratory Distress Syndrome*. New England Journal of Medicine, 2011. **364**(14): p. 1293-1304.
4. Wolfe, P.L. and K.A. Lehouckey, *Neuropsychological Assessment of Driving Capacity*. Arch Clin Neuropsychol, 2016. **31**(6): p. 517-29.
5. Ritchie, J. & Spencer, L. 1994. *Qualitative data analysis for applied policy research by Jane Ritchie and Liz Spencer in A. Bryman and R. G. Burgess [eds.] 'Analysing qualitative data', (pp.173-194). London: Routledge.*
6. Department for Transport. *GB Driving Licence Data*. 2019 [02 October 2019]; Available from: <https://data.gov.uk/dataset/d0be1ed2-9907-4ec4-b552-c048f6aec16a/gb-driving-licence-data>.
7. U.S Census Bureau. *American Community Survey 2017*. 2019 [cited 2020 8 January]; Available from: <https://www.census.gov/data/tables/2017/demo/industry-occupation/truckers-ac17.html>.
8. Hashem, M.D., et al., *Patient outcomes after critical illness: a systematic review of qualitative studies following hospital discharge*. Critical Care, 2016. **20**(1): p. 345.
9. Ågård, A.S., et al., *Struggling for independence: A grounded theory study on convalescence of ICU survivors 12 months post ICU discharge*. Intensive and Critical Care Nursing, 2012. **28**(2): p. 105-113.
10. Marottoli, R.A., Mendes de Leon, C. F., Glass, T. A., Williams, C. S., Cooney, L. M., Jr, Berkman, L. F., & Tinetti, M. E., *Driving cessation and increased depressive symptoms:*

- prospective evidence from the New Haven EPESE*. Journal of the American Geriatrics Society, 1997. **45**: p. 202-206.
11. Windsor, T.D., et al., *The Role of Perceived Control in Explaining Depressive Symptoms Associated With Driving Cessation in a Longitudinal Study*. The Gerontologist, 2007. **47**(2): p. 215-223.
  12. Marottoli, R.A., et al., *Consequences of Driving Cessation: Decreased Out-of-Home Activity Levels*. The Journals of Gerontology: Series B, 2000. **55**(6): p. S334-S340.
  13. Mezuk, B. and G.W. Rebok, *Social Integration and Social Support Among Older Adults Following Driving Cessation*. The Journals of Gerontology: Series B, 2008. **63**(5): p. S298-S303.
  14. Aronson, L., *Don't Ruin My Life - Aging and Driving in the 21st Century*. N Engl J Med, 2019. **380**(8): p. 705-707.
  15. Azoulay, E., et al., *Recovery after critical illness: putting the puzzle together-a consensus of 29*. Crit Care, 2017. **21**(1): p. 296.

**Additional File 1**

Driving After Intensive Care Survey

**Additional File 2**

Framework Analysis for Driving after Critical Illness

# Figures

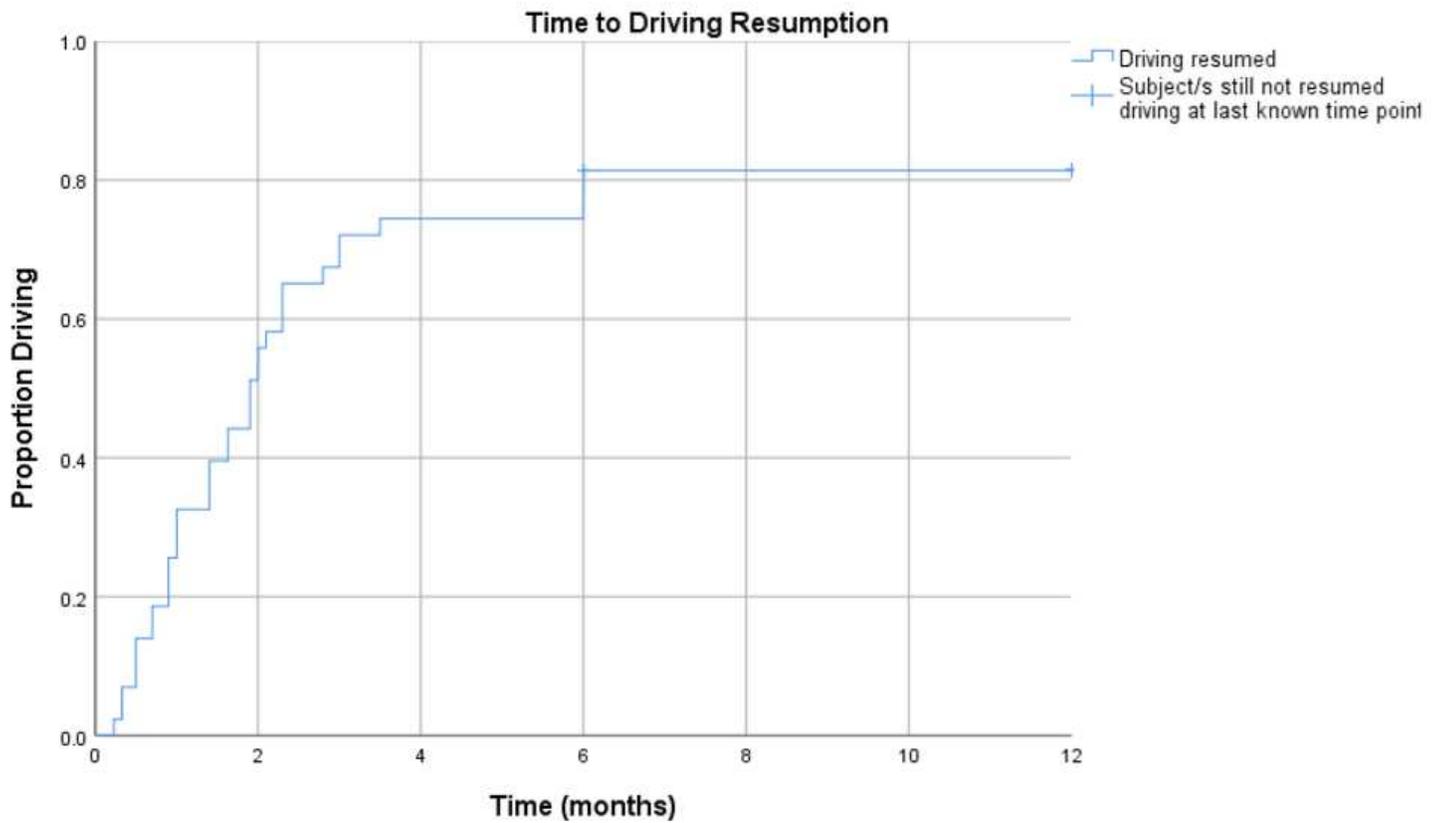


Figure 1

Kaplan-Meier curve time to driving resumption after ICU discharge

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdditionalFile1CRITICALCARE.pdf](#)
- [AdditionalFile2FrameworkanalysisCRITICALCARE.pdf](#)