

1 **Abstract**

2 Background: Clinicals trials are the bedrock for evidence-based practice amongst healthcare
3 professionals. Creating research opportunities through structured training is integral in
4 developing future research leaders including allied health professionals (AHP)s. The UK
5 National Institute for Health Research (NIHR) Associate Principal Investigator (API) scheme
6 was launched in 2019 to support trainee medical, dental, nursing and AHPs to gain practical
7 experience delivering clinical trials under local PIs. API certification requires completion of
8 activities which includes Good Clinical Practice Training, attendance at trial meetings, trial
9 recruitment and maintenance of site file related activities. The aim of this article was to
10 showcase how the activities completed by an AHP undertaking the API scheme support
11 researcher development.

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13 Methods: SIP SMART2 is a multicentre trial of swallowing prehabilitation in head and neck
14 cancer. SIP SMART2 was one of the first AHP-led trials to be registered on the API scheme
15 in April 2019 with six APIs registered. The example of one trainee's activities and skills
16 acquisition by completing the scheme were compared to a well-established researcher
17 development framework known as the Vitae Researcher Development Framework (RDF).

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19 Results: Activities completed during the API scheme supported development across all 4
20 domains of the RDF. In particular, Domain C (Research governance and organisation) and
21 Domain D (Engagement, influence and impact).

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23 Conclusion: The API scheme provides an opportunity for AHPs to gain skills and experience
24 to develop across all domains of the Vitae RDF. Future work should assess whether
25 completion of the API scheme leads to long-term engagement in clinical research.

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29 Introduction

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31 Clinical trials represent the bedrock of evidence-based practice and many new healthcare
32 interventions are first tested within a trial before they are adopted in practice (Evans, 2003;
33 McGovern DPB., 2001). However, within healthcare systems such as the UK National Health
34 Service (NHS), undertaking such investigations falls to clinicians who may not be research-
35 trained to design and conduct trials. The principal investigator (PI) at each site has oversight
36 responsibility for the conduct and administration of the trial, ensuring that the trial is delivered
37 according to the requirements of the protocol, sponsor guidelines and the principles of Good
38 Clinical Practice (GCP) (Health Research Authority, 2021) In the past, the PI role was
39 usually the preserve of medically trained staff within the NHS. Over the last couple of years it
40 has become clear that nurses and allied health professionals (AHP)s represent a willing and
41 untapped resource available to support the delivery of clinical trials (McNiven et al., 2021).
42 The National Institute of Health and Care Research (NIHR) is a major source of government
43 funding in the NHS and supports a large portfolio of studies by providing research and
44 infrastructure funding. In February 2019, the NIHR Associate Principal Investigator (API)
45 Scheme was developed to encourage junior clinicians/trainees to gain experience on NIHR
46 portfolio trials (*National Institute of Health and Care Research (NIHR). Associate Principal
47 Investigator Scheme.*, 2022) This was in the form of a six month in-work training opportunity
48 under the mentorship of a local PI. The scheme was seen as mutually beneficial: trainees
49 are well-placed to increase recruitment, support communication between the clinical site and
50 clinical trials unit and in turn develop leadership skills under the supervision of an
51 experienced PI. Following a successful pilot, the API scheme was launched nationally in the
52 UK on 3rd November 2021 and chief investigators were encouraged to consider registering
53 their multi-centre studies onto the scheme (*National Institute for Health Research (NIHR).
54 NIHR Associate Principal Investigator Scheme Virtual Launch Event*, 2021). A key aim of the
55 API scheme is to develop the next generation of clinical research leaders and PIs from a
56 medical, nursing and AHP background. The scheme is endorsed by several Royal Colleges

57 ensuring that trainees receive appropriate recognition and credit within their individual fields
58 and specialisms.

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60 The API scheme fits well into the agenda of building research capacity for AHPs which is
61 gaining momentum internationally (Matus et al., 2018; Slade et al., 2018; Wenke et al., 2017;
62 Wenke & Mickan, 2016). In 2017, it was reported that non-medical clinical academic AHPs
63 made up less than 0.1% of the workforce in comparison with 4.6% of clinical academic
64 medical professionals (Medical Research Council, 2017; Medical Schools Council, 2017).
65 Benefits of AHP research positions within clinical settings have been reported to be impactful
66 across individual, organisational/community and team/service level. These include enhanced
67 research culture, activity and outputs; staff development (clinical, professional and research);
68 improved profile of AHPs and clinical/service changes (Wenke et al., 2017). AHPs are
69 optimally placed to conduct clinical research given their clinical roles, often being actively
70 involved in direct patient care (Jones & Keenan, 2021). The API scheme offers an
71 opportunity to play a vital role in the delivery of clinical research, acquire research skills and
72 experience whilst enhancing and embedding a research culture (*National Institute of Health
73 and Care Research (NIHR). Associate Principal Investigator Scheme.*, 2022).

74

75 SIP SMART2 is a pilot multi-centre swallowing prehabilitation trial (ISRCTN12377415) and
76 one of the first AHP-led trials to be registered on the API scheme. This article provides a
77 case study on the skills AHPs may be expected to acquire on the API scheme by using the
78 example of a trainee on the SIP SMART2 trial and comparing their skill acquisition to a well-
79 known researcher development framework known as the Vitae RDF (*Vitae: Researcher
80 Development Framework. Careers Research and Advisory Centre (CRAC) Limited, 2011*).

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85 **Methods:**

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87 *Registration of the SIP SMART2 trial on the NIHR API scheme*

88 SIP SMART2 is a multi-centre clinical trial, funded by the NIHR and part of their portfolio of
89 studies. It was therefore eligible to be registered on the NIHR API scheme allowing one
90 trainee (at a time) at each trial site to work under supervision and with the agreement of the
91 site PI and in some cases the Clinical Trials Unit. Following trial registration on the API
92 scheme in April 2022, six trainees (uptake at all but one site) signed onto the scheme and at
93 the time of submitting this manuscript, two (one dietitian and one speech and language
94 therapist) have received their API accreditation. They were required to access the NIHR API
95 checklist from the NIHR Learn Hub and to ensure together with their PI mentor, that they
96 were able to meet the requisite criteria within a six-month timeframe. The typical activities
97 on the checklist have been matched against the Vitae framework and form the basis of our
98 Results and Discussion that follows.

99

100 *Vitae Researcher Development Framework (RDF)*

101 The Vitae Researcher Development Framework (RDF) (Figure 1) was developed by experts
102 through a variety of methodologies including semi-structured interviews and validated by an
103 independent panel of researchers, experts and stakeholders (Reeves et al., 2012). The Vitae
104 RDF was introduced in 2009 and is used widely as a tool by researchers at any stage of
105 their career to support and track development. The RDF captures the behaviours, attributes,
106 and knowledge of successful researchers and is structured into 4 domains:

- 107 • Domain A: Knowledge and intellectual abilities
- 108 • Domain B: Personal effectiveness
- 109 • Domain C: Research governance and organisation
- 110 • Domain D: Engagement, influence and impact

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112 **Results:**

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114 Table 1 and Supplementary Figure 1 depicts the 26 API activities completed by the single
115 trainee (10 core and 4 additional activities required for certification of API status and 12
116 specific to SIP SMART2) against the Vitae RDF domains. The API scheme is shown to
117 include activities that fit all the Vitae RDF domains. Domain A (Knowledge and intellectual
118 abilities) was met on 15 instances by 11 activities; Domain B (Personal effectiveness) on 32
119 instances by 21 activities; Domain C (Research governance and organisation) on 35
120 instances by 22 activities and Domain D (Engagement, influence and impact) on 34
121 instances by 22 activities.

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123 Figure 2 depicts the breakdown of how the core and additional API checklist activities
124 corresponded proportionately to Vitae RDF domains for the single trainee's checklist. The 14
125 activities on the API checklist included 10 core and 4 additional activities. These activities
126 were logged against whether they met each Vitae RDF sub-domains and corresponding
127 overall percentage:

128 Vitae RDF domains were met on a total of 50 instances by completing the 14 core/additional
129 API activities. A1 was met by 2 core activities and 2 additional activities (8%); A2 was met by
130 0 core activities and 1 additional activity (2%); A3 was met by 0 core activities and 0
131 additional activities (0%); B1 was met by 1 core activity and 1 additional activity (4%); B2
132 was met by 2 core activities and 0 additional activities (4%); B3 was met by 5 core activities
133 and 3 additional activities (16%); C1 was met by 4 core activities and 3 additional activities
134 (14%); C2 was met by 7 core activities and 2 additional activities (18%); C3 was met by 0
135 core activities and 0 additional activities (0%); D1 was met by 7 core activities and 3
136 additional activities (20%); D2 was met by 3 core activities and 2 additional activities (10%);
137 D3 was met by 1 core activity and 1 additional activity (4%).

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139 Overall, the instances where RDF domains were met by the API core and additional
140 activities corresponded to 10% for Domain A (Knowledge and intellectual abilities); 24% for
141 Domain B (Personal effectiveness); 32% for Domain C (Research governance and
142 organisation); and 34% for Domain D: Engagement, influence and impact.

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144 **Discussion:**

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146 The aim of this article was to showcase participation of AHPs in what has traditionally been
147 thought of as a role for medically qualified clinicians by highlighting a training scheme known
148 as the NIHR Associate PI Scheme. We considered the skills, activities and experiences
149 gained by an AHP undertaking the API scheme on an AHP-led clinical trial (SIP SMART2)
150 against the widely used Vitae RDF. We report that completion of the core and additional
151 activities from the API scheme as well as SIP SMART2 specific activities provided
152 opportunities for development against all Vitae RDF domains. In particular, the exposure to
153 trial governance and practical experience gained supported researcher development in
154 domains C (Research governance and organisation) and D (Engagement, influence and
155 impact).

156 Our findings are in accordance with previous articles reporting beneficial effects on uptake of
157 the API scheme for developing trainee researchers. In the NIHR Sunflower RCT, one of the
158 pilot projects of the scheme, Jepson and colleagues (2021) undertook qualitative interviews
159 on 17 trainees and 17 consultants. Trainees reported that participation of the API scheme
160 had potential benefit for their career development, informing their own clinical practice and
161 cited this as the main reason for engaging with the scheme. The paperwork required for
162 completion of the scheme was reported as burdensome by some and a potential barrier
163 towards uptake. However, the formal recognition provided by the scheme was regarded as
164 beneficial, in particular, the ability to show evidence of recruiting participants and
165 collaboration in research which would contribute to the completion of the Certificate
166 Completion of Training (CCT) (Dinneen & Shaw, 2020). Activities completed by APIs

167 included screening and assessing for eligibility, study compliance activities e.g. maintaining
168 the screening log, discussing the study with potential participants, consenting and recruiting
169 participants and completion of GCP training (Jepson et al., 2021).

170 Recruitment of participants into RCTs is known to be challenging and not meeting target
171 recruitment can lead to underpowered studies with implications for validity of results (Sully et
172 al., 2013). Training of staff has been identified as a key priority to improve recruitment
173 (Bower et al., 2014). The API scheme has been reported to have significant benefits by
174 improving trial recruitment, especially out-of-hours elective admissions. Indeed, consent for
175 the Sunflower Study was taken by trainees in 35% (n=185) of acute patients and 11% of
176 elective patents (n=175) demonstrating the mutual benefit the API scheme provides (Jepson
177 et al., 2021). These findings are consistent with Vas and colleagues (2021) who reported
178 improved recruitment of eligible participants following introduction of a local trainee PI
179 scheme which has similarities to the API scheme (Vas et al., 2021).

180

181 AHPs constitute around a third of the health and social care workforce in the UK (*National*
182 *Health Service Workforce Statistics*, 2022). Realising the potential of AHPs in delivering
183 research is integral to the NIHR's mission (*Council for Allied Health Professions Research:*
184 *About CAHPR*, 2022). Prior studies have reported that AHPs report a lack of confidence in
185 their research knowledge and skills and opportunities to develop can be lacking (Borkowski
186 et al., 2016). This is the first article to our knowledge that has reported completion of the API
187 scheme by an AHP, on an AHP-led trial, and under the supervision of an AHP PI. Six AHPs
188 registered to be APIs on SIP SMART2, with two completing the scheme and awarded
189 certification as of November 2022. This demonstrates a clear opportunity for senior AHP
190 researchers to supervise and mentor early career AHP researchers to develop into PIs for
191 RCTs within the clinical setting. This is in accordance with a recent study that developed a
192 research framework for AHPs in the UK which included building capability, training
193 opportunities and research culture amongst AHPs (Harris et al., 2020).

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195 *Strengths and Limitations:*

196 Whilst this study is limited by the fact that it reports on the activity of a single AHP at a single
197 site, we hope that it has introduced a useful scheme for furthering the agenda for the
198 development of AHPs who both lead and help to deliver multi-centre research trials.

199

200 *Future directions:*

201 Further work should include qualitative research studies exploring AHP experiences of both
202 APIs and PIs undertaking the API scheme in AHP led trials, and the impact on the wider
203 research/clinical team. Longitudinal studies are warranted to review the trajectory of APIs
204 and whether completing the scheme leads to long-term involvement and engagement in
205 clinical research. **The API scheme provides a model for training to support development of
206 principal investigators that could be adopted in other countries, where this does yet exist.**

207

208 **Conclusion:**

209 Building opportunities for AHPs to develop research skills is integral for fostering a research
210 culture in healthcare settings. Uptake of the NIHR API scheme on an AHP led trial (SIP
211 SMART2) created an opportunity for AHPs to develop research skills and experience which
212 corresponded well to Vitae RDF domains.

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225 **References:**

226 Borkowski, D., McKinstry, C., Cotchett, M., Williams, C., & Haines, T. (2016). Research

227 culture in allied health: A systematic review. *Australian Journal of Primary Health,*

228 22(4), 294. <https://doi.org/10.1071/PY15122>

229 Bower, P., Brueton, V., Gamble, C., Treweek, S., Smith, C. T., Young, B., & Williamson, P.

230 (2014). Interventions to improve recruitment and retention in clinical trials: A survey

231 and workshop to assess current practice and future priorities. *Trials, 15,* 399.

232 <https://doi.org/10.1186/1745-6215-15-399>

233 *Council for Allied Health Professions Research: About CAHPR.* (2022). online.

234 [<https://cahpr.csp.org.uk/about-cahpr>]

235 Dinneen, E., & Shaw, G. (2020). Life of PI (Associate). *BJU International, 126*(6), 754–755.

236 <https://doi.org/10.1111/bju.15292>

237 Evans, D. (2003). Hierarchy of evidence: A framework for ranking evidence evaluating

238 healthcare interventions. *Journal of Clinical Nursing, 12*(1), 77–84.

239 <https://doi.org/10.1046/j.1365-2702.2003.00662.x>

240 Harris, J., Grafton, K., & Cooke, J. (2020). Developing a consolidated research framework

241 for clinical allied health professionals practising in the UK. *BMC Health Services*

242 *Research, 20*(1), 852. <https://doi.org/10.1186/s12913-020-05650-3>

243 Health Research Authority. (2021). *Research Planning: Roles and Responsibilities.* online.

244 [https://www.hra.nhs.uk/planning-and-improving-research/research-planning/roles-](https://www.hra.nhs.uk/planning-and-improving-research/research-planning/roles-and-responsibilities/)

245 [and-responsibilities/](https://www.hra.nhs.uk/planning-and-improving-research/research-planning/roles-and-responsibilities/)

246 Jepson, M., Lazaroo, M., Pathak, S., Blencowe, N., Collingwood, J., Clout, M., Toogood, G.,

247 Blazeby, J., & on behalf of the Sunflower Study Executive Group. (2021). Making

248 large-scale surgical trials possible: Collaboration and the role of surgical trainees.

249 *Trials, 22*(1), 567. <https://doi.org/10.1186/s13063-021-05536-7>

250 Jones, D., & Keenan, A.-M. (2021). The rise and rise of NMAHPs in UK clinical research.
251 *Future Healthcare Journal*, 8(2), e195–e197. <https://doi.org/10.7861/fhj.2021-0098>

252 Matus, J., Walker, A., & Mickan, S. (2018). Research capacity building frameworks for allied
253 health professionals – a systematic review. *BMC Health Services Research*, 18(1),
254 716. <https://doi.org/10.1186/s12913-018-3518-7>

255 McGovern DPB. (2001). *Randomized controlled trials: Key topics in evidence based*
256 *medicine*. (Vols 26–9). Oxford: BIOS Scientific Publishers.

257 McNiven, A., Boulton, M., Locock, L., & Hinton, L. (2021). Boundary spanning and identity
258 work in the clinical research delivery workforce: A qualitative study of research
259 nurses, midwives and allied health professionals in the National Health Service,
260 United Kingdom. *Health Research Policy and Systems*, 19(1), 74.
261 <https://doi.org/10.1186/s12961-021-00722-0>

262 Medical Research Council. (2017). *2017 UK-Wide Survey of Clinical and Health Research*
263 *Fellowships*. online

264 Medical Schools Council. (2017). *Survey of Medical Clinical Academic Staffing Levels 2017*.
265 online.

266 *National Health Service Workforce Statistics*. (2022). online. [https://digital.nhs.uk/data-and-](https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics)
267 [information/publications/statistical/nhs-workforce-statistics](https://digital.nhs.uk/data-and-information/publications/statistical/nhs-workforce-statistics)

268 *National Institute for Health Research (NIHR). NIHR Associate Principal Investigator*
269 *Scheme Virtual Launch Event*. (2021). <https://www.associatepilaunch.com>

270 *National Institute of Health and Care Research (NIHR). Associate Principal Investigator*
271 *Scheme*. (2022). Online. [https://www.nihr.ac.uk/health-and-care-](https://www.nihr.ac.uk/health-and-care-professionals/career-development/associate-principal-investigator-scheme.htm)
272 [professionals/career-development/associate-principal-investigator-scheme.htm](https://www.nihr.ac.uk/health-and-care-professionals/career-development/associate-principal-investigator-scheme.htm)

273 Reeves, J., Denicolo, P., Metcalfe, J., & Roberts, J. (2012). *The Vitae Researcher*
274 *Development Framework and Researcher Development Statement: Methodology*
275 *and validation report*. Careers Research & Advisory Centre (CRAC) Ltd.

276 Slade, S. C., Philip, K., & Morris, M. E. (2018). Frameworks for embedding a research
277 culture in allied health practice: A rapid review. *Health Research Policy and Systems*,
278 16(1), 29. <https://doi.org/10.1186/s12961-018-0304-2>

279 Sully, B. G. O., Julious, S. A., & Nicholl, J. (2013). A reinvestigation of recruitment to
280 randomised, controlled, multicenter trials: A review of trials funded by two UK funding
281 agencies. *Trials*, 14(1), 166. <https://doi.org/10.1186/1745-6215-14-166>

282 Vas, A., D'sa, P., Gokhale, S., Agarwal, T., Roberts, G. L., & Mohanty, K. (2021). Trainee
283 Principal Investigator Could Improve Recruitment in Trauma Trials: Review of
284 Literature and Experience From a Trauma Center. *Cureus*.
285 <https://doi.org/10.7759/cureus.18920>

286 *Vitae: Researcher Development Framework*. *Careers Research and Advisory Centre*
287 *(CRAC) Limited*. (2011). <https://www.vitae.ac.uk/about-us>

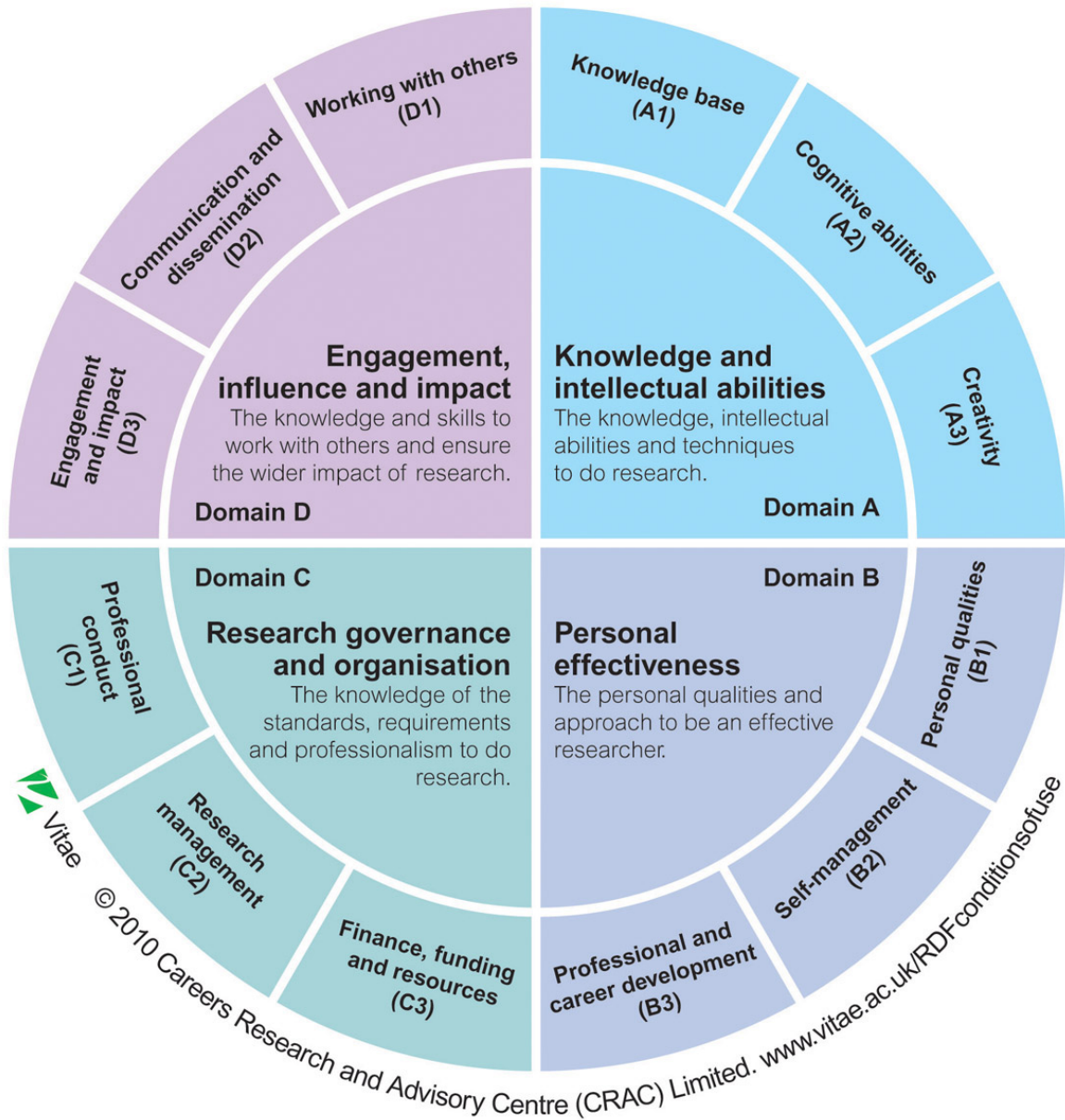
288 Wenke, R. J., Ward, E. C., Hickman, I., Hulcombe, J., Phillips, R., & Mickan, S. (2017). Allied
289 health research positions: A qualitative evaluation of their impact. *Health Research*
290 *Policy and Systems*, 15(1), 6. <https://doi.org/10.1186/s12961-016-0166-4>

291 Wenke, R., & Mickan, S. (2016). The role and impact of research positions within health care
292 settings in allied health: A systematic review. *BMC Health Services Research*, 16(1),
293 355. <https://doi.org/10.1186/s12913-016-1606-0>

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Figure 1: Vitae Research Development Framework (re-produced with permission from Vitae)



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Source: (Vitae: Researcher Development Framework. Careers Research and Advisory Centre (CRAC) Limited, 2011)

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316 Table 1: NIHR API activity with corresponding Vitae RDF domain

NIHR API Checklist Activity	Vitae RDF Domain											
	A1	A2	A3	B1	B2	B3	C1	C2	C3	D1	D2	D3
Core activities (10)												
Be a member of the site research team						X				X		
6-month involvement at a single site (set-up or follow-up phase)								X				
Dissemination of the study and engaging with the clinical departments						X					X	
Regular engagement with the research team including the PI and delivery team, site log maintenance, recruitment progress, protocol amendments, data returns and quality	X					X	X	X		X		
Completion and updating of the delegation log					X			X		X		
Ensuring research delivery team has up to date GCP and signed CVs							X	X		X		
Education of other health professionals working on the study and ensuring those on the delegation log are informed of the protocol requirements and study procedures	X				X		X			X	X	X
Monthly research team meetings with the PI, delivery, and clinical team						X		X		X		
Reviewing screening logs and ensuring compliance of recruitment per inclusion criteria								X				
Recruitment, consenting and follow up of participants				X		X	X	X		X	X	
Additional activities (4)												
Deputising for the PI, interacting with the Clinical Trials Unit, Clinical Research Network and collaborating with APIs at other centres	X			X		X	X	X		X	X	
Patient and Public Involvement activities										X	X	X
Activities related to Trial management group meetings						X	X	X		X		

Training courses e.g. GRANULE, GCP, INSPIRE, FUNDAMENTALS	X	X			X	X			
SIP SMART2 activities (12)									
Liaising potential eligible patients to treating Consultant, PI and Research Nurse after MDT every week to be approached in clinic.				X	X		X		X
Attended Site Initiation Visit	X					X	X		X
Completed GCP, GRANULE and PPI workshops	X	X	X		X	X	X	X	X
Delegated responsibilities: obtain patient written informed consent; confirm patient eligibility; co-ordination of trial; screening of patients; review and sign off on source data and CRFs; maintain screening/enrolment logs; inform patients of trial; sign consent on behalf of CI	X				X		X	X	X X X
Adding amendments and acting on these following feedback from site initiation report				X		X	X	X	X
Recruited, informed and consented 3 patients	X			X	X	X	X	X	X X
Knowledge gained about trial governance e.g. protocol, insurance requirements, data protection, case report forms, funding source	X						X	X	X
Organisation: trial recruitment and monitoring target with research nurse					X		X		X
Collaborated with APIs at other centers with the plan to present our work at a national conference			X			X			X X X
Communicating risks/benefits of participation and explaining equipoise		X	X	X		X	X		X X
Taking responsibility for screening patients from MDT				X	X		X		X
API certification status on completion of the checklist				X	X	X	X	X	X

317 All core activities required for accreditation of API status on completion of the scheme.

318 Vitae RDF domains: Domain A: Knowledge and intellectual abilities; Domain B: Personal Effectiveness; Domain C: Research Governance and

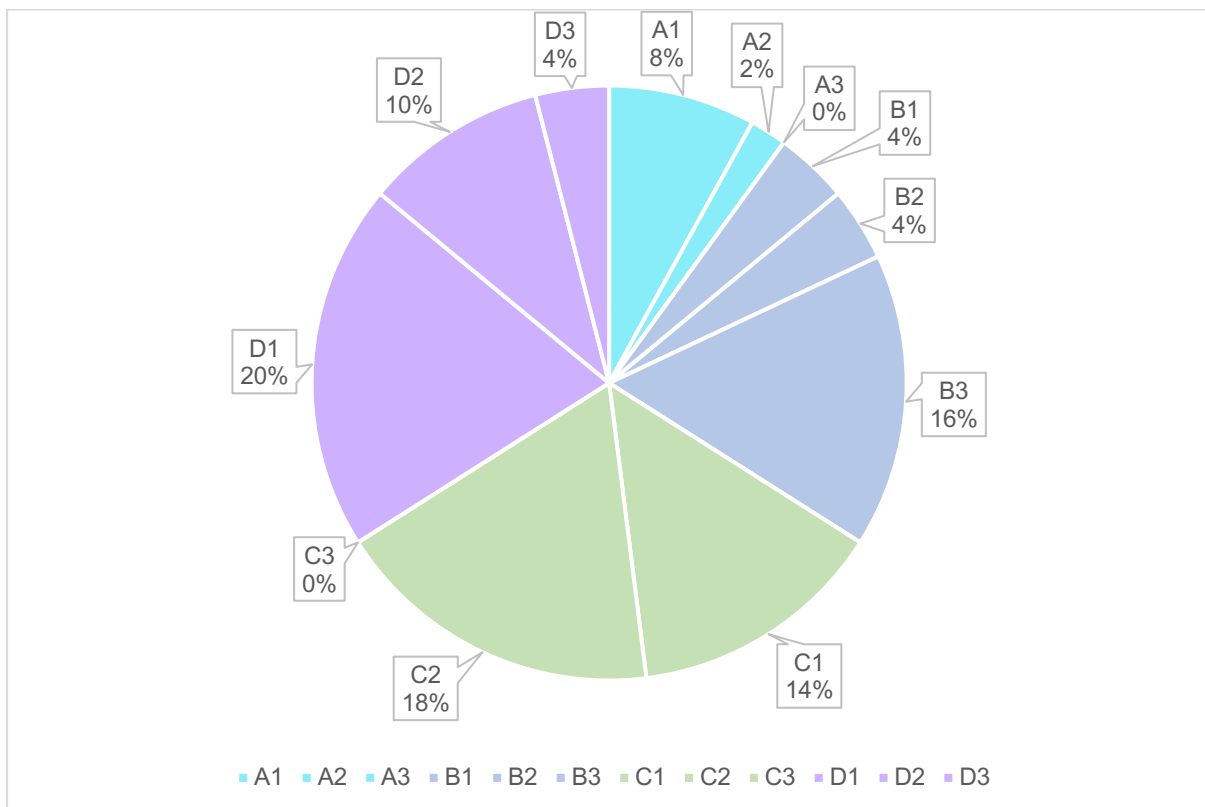
319 organisation; Domain D: Engagement, influence and Impact.

320 A1 = Knowledge base; A2: Cognitive abilities; A3 Creativity; B1 Personal qualities; B2 Self-management; B3 Professional and career
 321 development; C1 Professional conduct; C2 Research management; C3 Finance, funding, and resources; D1 Working with others; D2
 322 Communication and dissemination; D3 Engagement and Impact. Abbreviations: API = Associate Principal Investigator; PI = Principal Investigator;
 323 MDT = multi-disciplinary team; CV = Curriculum Vitae; GCP = Good Clinical Practice.

324

325 Figure 2: Chart to show the breakdown of API core/additional checklist activities against

326 Vitae RDF domains



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328 Vitae RDF domains: Domain A: Knowledge and intellectual abilities; Domain B: Personal effectiveness; Domain C: Research governance and
 329 organisation; Domain D: Engagement, influence and impact

330 A1 = Knowledge base; A2: Cognitive abilities; A3 Creativity; B1 Personal qualities; B2 Self-management; B3 Professional and career

331 development; C1 Professional conduct; C2 Research management; C3 Finance, funding, and resources; D1 Working with others; D2

332 Communication and dissemination; D3 Engagement and impact. Abbreviations: API = Associate Principal Investigator

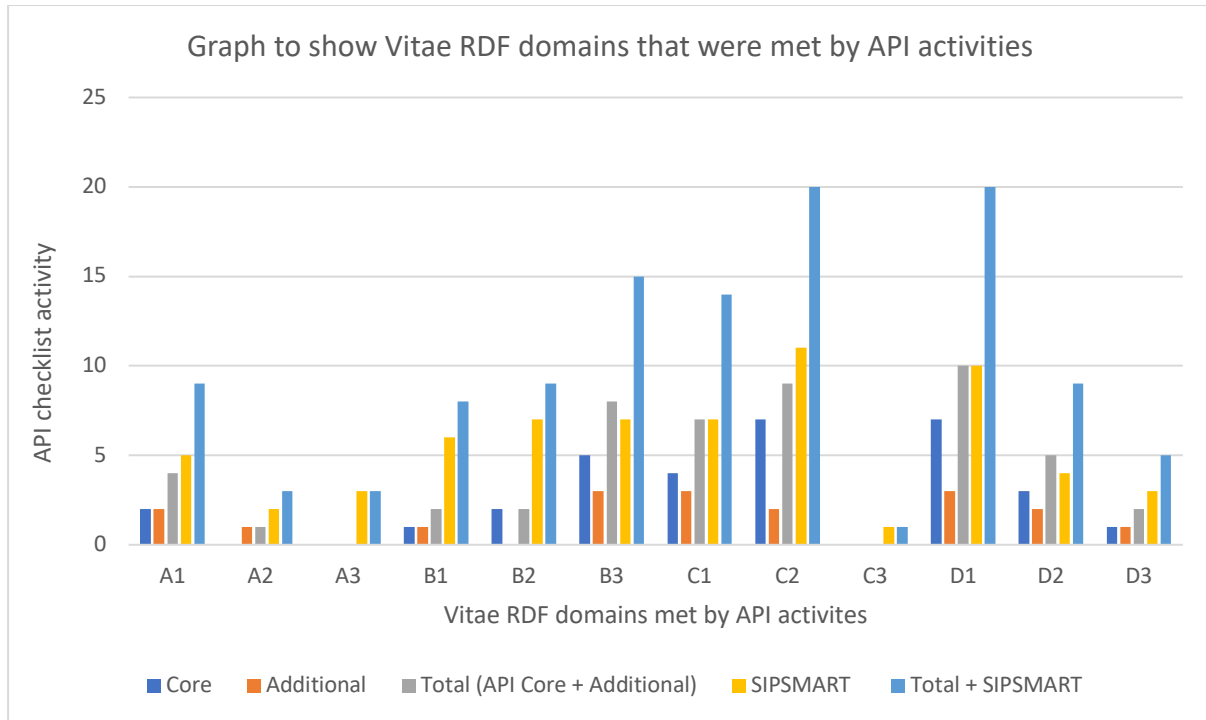
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336 Supplementary Figure 1: Chart to show API checklist activities against Vitae RDF domains

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339 Vitae RDF domains: Domain A: Knowledge and intellectual abilities; Domain B: Personal effectiveness; Domain C: Research governance and
340 organisation; Domain D: Engagement, influence and impact

341 A1 = Knowledge base; A2: Cognitive abilities; A3 Creativity; B1 Personal qualities; B2 Self-management; B3 Professional and career

342 development; C1 Professional conduct; C2 Research management; C3 Finance, funding, and resources; D1 Working with others; D2

343 Communication and dissemination; D3 Engagement and impact. Abbreviations: API = Associate Principal Investigator.

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