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<th><strong>R01 Countdown: Tools for Writing Concise and Compelling Grants</strong></th>
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<td><strong>8 recommended elements for writing a concise and compelling specific aims page</strong></td>
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| **Adjust ‘relative weight’ of aims page** | • Imagine reviewers only read the aims. Provide everything reviewers need to scientifically evaluate the entire proposal within the 1 page. It should be able to stand alone.  
• Within ½ page, include (only) 1-2 sentences about clinical significance, followed by 1-2 paragraphs setting up scientific significance, and then a separate paragraph setting up innovation.  
• In the remaining ½ page, state three aims as testable hypotheses. Under each aim, concisely provide essential, relevant details so reviewers can already begin to evaluate methodological rigor.  
• Provide equal level of detail and space to all aims, especially the (often neglected) third aim.  
• [Preliminary Data] Integrate preliminary data throughout the 1 page if available, including scientific significance, innovation, and each of the three individual aim paragraphs.  
• Leave reviewers already compelled about the science and excited to read more (the ‘POW factor’). Imagine the Research Strategy is designed merely to expand on details. |
| **Clearly differentiate among clinical significance, scientific significance, and innovation** | • Assume proposals need to receive 1-2s on both NIH criteria (significance and innovation) for an outstanding overall impact score. Receiving any 3-4s (‘Land of Mush’) on either of these criteria may not be sufficient, and fixing approach details will not be enough.  
• Within the 1 page, address both parts of the NIH significance criterion: clinical significance (addresses a clinical problem) and scientific significance (advances scientific knowledge).  
• Place more emphasis on scientific (not clinical) significance, including relative number of sentences.  
• Make it easy for reviewers to assign separate and stellar scores for significance and innovation by constructing separate paragraphs for each criteria that stipulate substantively different non-overlapping strengths. Consider the two criteria ‘orthogonal’ to one another.  
• One strategy: Distinguish what new paradigm shift is being proposed (scientific significance) from how it will be accomplished (innovative methods/technologies). |
| **Briefly address clinical significance** | • [Clinical Significance] In (only) 1-2 sentences, state clinical significance. Include 2-3 convincing, evidence-based numerical details on prevalence, morbidity, mortality, and/or health care costs.  
• Seek out details and synthesize across reference citations. Avoid vague phrases like ‘increased risk’ or ‘important clinical need’. |
| **Use contrast sentences to emphasize scientific significance** | • Make it easy for fast-moving reviewers to detect scientific significance by starting a new paragraph rather than burying it deep within or at the end of a paragraph.  
• [Paradigm Shift] In 1 concise sentence, state the paradigm shift being proposed. Bold it. Reviewers return to this single sentence for writing reviews and orally presenting to study section.  
• [Synthesized Limitations] In 1 concise sentence, synthesize the limitations of prior paradigm(s). Choose 1 of 2 contrast tactics to explicitly juxtapose the paradigm shift with prior paradigm(s):  
1. FUNNEL DOWN Lead with synthesized limitations (and preliminary data), then paradigm shift.  
2. [GO BOLD] Lead w/ paradigm shift, then limitations (and prelim data). Go Bold is riskier, but fun.  
• To underscore the contrast between the paradigm shift and synthesized limitations, use the same dimensions and same key terms in the same order in both sentences. |
| **Use contrast sentences to highlight innovation** | • [Innovation Topic Sentence] Make it easy for fast-moving reviewers to detect innovation by using 1 brief, bolded topic sentence with the key term ‘innovative’ and state # of innovative aspects.  
• [Innovation] Describe each innovation in 1 sentence. Use numerical transitions (e.g., First, Second) to introduce each innovation sentence.  
• [Innovation Contrast] Just because it’s never been done before doesn’t make it innovative. Instead, follow each innovation sentence with 1 succinct contrast sentence that explicitly juxtaposes the innovation’s strengths with the limitations of current methods or standards in the field.  
• To underscore the contrast between the innovation and the limitations of current methods in the field, use the same dimensions and same key terms in the same order in both sentences.  
• Use convincing numerical details in the innovation and contrast sentences when possible. |
| **Identify team expertise** | • [Team Expertise] In 1 sentence, identify the expertise areas of the multidisciplinary team.  
• For disciplines, use the same key terms from the earlier significance and innovation paragraphs. |
| **State a hypothesis and method details for each aim** | • [Hypothesis] In 1 sentence, explicitly state the direction of hypothesis for each aim (e.g., bigger, ‘badder’, better). Reviewers are compelled by applications that marshal evidence and take a stand on potential outcomes.  
• [Methods Details] Include concise, essential, and specific methodological details for each aim.  
• Underline each innovative method from the innovation paragraph earlier. |
| **Write concisely** | • Avoid scientific jargon. If it’s a multidisciplinary application, particular reviewers may only have expertise in 1 discipline and little knowledge of even basic vocabulary for the other disciplines.  
• Avoid ice-cream consumption—the pervasive academic tendency to use more complicated or highfalutin words than necessary. Instead, simply... eat more ice cream.  
• Eliminate pink fluff—delete any repetitive or vague words, phrases, or sentences that do not explicitly add new information—or risk reviewers being distracted by their email or cell phone.  
• To systematically condense as concisely as possible, combine Mimi Zeiger’s writing techniques (Zeiger M. Essentials of Writing Biomedical Research Papers. 2nd ed. McGraw-Hill; 2000): ‘repeat key terms’ (p. 58), ‘use a consistent point of view’ (p. 84), ‘put parallel ideas in parallel form’ (p. 89), and then condense.  
• To enhance ‘continuity’ (Zeiger, p. 58) for an easy, seamless read, use another Zeiger combination: ‘repeat key terms’ (p. 58) and ‘use a consistent order’ (p. 83), including across all tables and figures. |
### R01 Countdown: Tools for Writing Concise and Compelling Grants

**Examples of specific aims elements from awarded NIH grants**

| Briefly address clinical significance | • **[Clinical Significance]** Osteoporosis affects 50% of women and 25% of men over age 50, increasing fracture risk. Hip fractures are particularly devastating as 20% of adults with a hip fracture die within 1 year and another 50% never walk independently again. [PI Wu R01 AR073773]  
| Use contrast sentences to emphasize scientific significance | • **[Synthesized Limitations]** Devastating movement and seizure disorders can be dramatically alleviated via deep brain stimulation and ablative surgeries that target innervation sites of specific fiber pathways. Diffusion magnetic resonance imaging (dMRI) fiber tracking is the only imaging method available to map these fiber pathways, improve targeting accuracy, and identify new targets for these surgically invasive treatments. Unfortunately, clinical application of dMRI for presurgical guidance is impeded by the lack of understanding for the influence of histological features on accurate fiber tracking. **[Paradigm Shift]** To determine the influence of histological features, we will compare high-resolution postmortem dMRI fiber tracking against direct optical observation of individual neurons using CLARITY in the same intact, fixed human brain tissue specimens. We propose that for a given voxel-size and degree of diffusion-weighting of the MRI signal, there will be detection limits regarding the histological features (minimum size, myelination, density, and distance from neighboring pathways) for any given fiber pathway to be accurately mapped with dMRI fiber tracking. [PI McNab R01 NS095985]  
| Use contrast sentences to highlight innovation | • **[Innovation Topic Sentence]** Two innovative features of our approach reduce the workload and risk compared to prior, ex vivo live imaging. **[Innovation #1]** First, we image the midgut in situ within a living animal, **[Innovation Contrast #1]** which extends viability up to 8 times longer than ex vivo imaging. **[Innovation #2]** Second, we use a 1.0 NA 20X dipping objective, which captures 4 times more cells with comparable micron resolution **[Innovation Contrast #2]** relative to standard 4X objectives, these features yield geometrically more data in fewer imaging sessions, which reduces workload and risk. [PI O'Brien R01 GM116009]  
| Identify team expertise | • **[Team Expertise]** Our research team includes experts and inventors of high-resolution postmortem dMRI and CLARITY 3D histology. We have established a strong collaboration across the disparate fields of MRI physics, neuroradiology, neuropathology, neurosurgery, neurology, and bioengineering (tissue cleaning and optical imaging). [PI McNab R01 NS095985]  
| State a hypothesis and method details for each aim | • **Aim 1:** To test the association of multi-level risk factors with neonatal intensive care unit (NICU) quality of care. **[Hypothesis]** We hypothesize that sociodemographic and neighborhood factors are independently and jointly associated with quality of care within NICUs as vulnerable infants may receive worse care (Aim 1a) and across NICUs as vulnerable populations may have to be accurately mapped with dMRI fiber tracking. [PI Wu R01 AR073773]  

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[1] Examples included with permission of Principal Investigators, see NIH RePORTER for grant details.