

LETTER TO THE EDITOR**Catalyzing delirium research: The NIDUS delirium network**

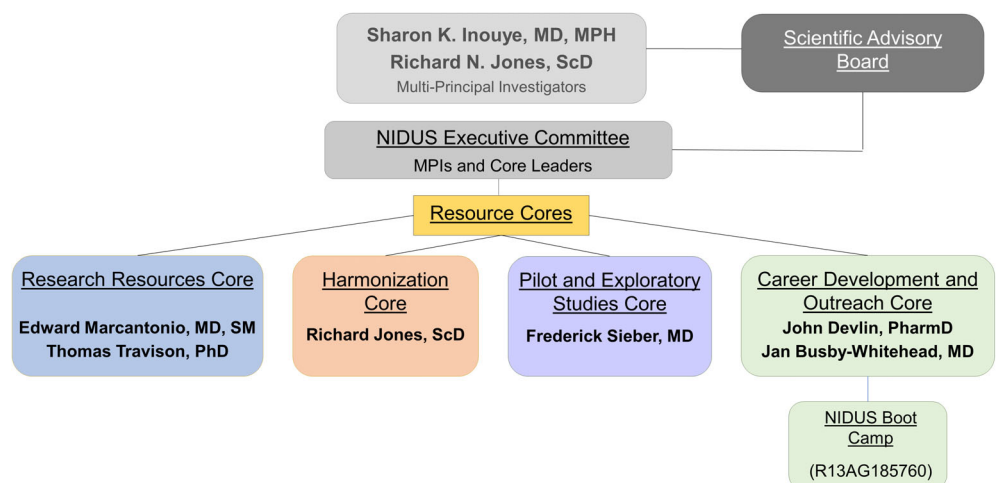
Delirium, an acute disorder of attention and cognition, has been well-recognized as a common, serious, and potentially preventable contributor to poor outcomes in older adults, including substantial morbidity, mortality, and loss of independence, along with tremendous health-care costs.<sup>1,2</sup> Despite its importance, delirium remains relatively neglected as an area of scientific investigation. To address this gap, the NIA issued RFA-AG-16-009 in 2015, intended to create a transdisciplinary, collaborative, research network to advance the field—one of the earliest NIA research networks of this kind. The grant was intended to create a robust infrastructure to support and nurture collaboration in delirium research, to provide career development for junior investigators, and to catalyze delirium research.

In response, the Network for Investigation of Delirium: Unifying Scientists (NIDUS) (R24AG054259; PI: SK Inouye) was proposed and funded in 2016, with the overarching goal of developing the collaborative network and infrastructure to advance scientific research and training on the causes, mechanisms, outcomes, diagnosis, prevention, and treatment of delirium in older adults.<sup>3</sup> Through a dedicated collaborative effort of 28 investigators (12 NIDUS leaders and 16 Scientific Advisory Board members), working across 4 cores (Figure 1), NIDUS succeeded in unifying the field, catalyzing new projects, mentoring new generations of delirium researchers, and widely disseminating information about delirium across disciplines

and to the general public. The Research Resources Core created the NIDUS Research Hub, which provides a detailed index to over 1800 studies in delirium—both active and completed. The Measurement and Harmonization Core created Delirium Information Cards on more than 45 validated delirium instruments and developed tools that directly harmonize the most commonly used measures for delirium identification and severity.<sup>4,5</sup> The Pilot Core awarded more than 20 small grants to catalyze exploratory projects or preliminary work for future grants (~3 to 4/year).

The Career Development and Dissemination Core oversaw the highly successful annual Delirium Boot Camp, a 2.5-day intensive training course in delirium research. To date, 126 mentees from 9 countries have attended 11 Boot Camps. In addition, NIDUS synergized the field with a robust website, webinars, blogs, newsletters, White Papers,<sup>6,7</sup> mentorship, Delirium Bibliography, annual symposia, social media, and extensive collaborations with the American Delirium Society, American Geriatrics Society (AGS), AGS CoCare HELP, and international delirium societies in Europe, Australia/Asia, and Brazil. See Table 1 for details on NIDUS accomplishments (2016–2023).

In 2020, NIDUS was renewed as NIDUS II under an R33 mechanism (R33AG071744, MPI: SK Inouye, RN Jones), based on its success in the first cycle. The structure of NIDUS remained essentially the same; however,



**FIGURE 1** Organizational structure of NIDUS II (R33AG071744).

TABLE 1 Summary of NIDUS-I and NIDUS-II accomplishments.<sup>a</sup>

Core/task force <sup>b</sup>	Goals	Accomplishment(s)
NIDUS-wide	Website creation and revision	More than 20,000 registered users; more than 40,000 page views per year. All NIDUS resources (including webinars, blogs, and Bootcamp lectures) now searchable by curated topics most relevant to delirium researchers.
	Twitter promotion	More than 3500 followers; 20 tweets sent per month.
	Newsletters	Monthly email blasts and topical quarterly newsletters to all registered users.
	Programming at ADS Annual Meeting	Topical NIDUS symposium, pilot award research presentations (3–4/year), oral abstract presentations (8 per year; Bootcamp alumni and/or prior pilot awardees).
	External engagement with stakeholder organizations	Regular engagement with 20 stakeholder organizations to promote NIDUS and its resources, pilot awards and Bootcamp.
	NIDUS White Papers	White Papers on a roadmap to advance delirium research <sup>6</sup> and preclinical and translational delirium models <sup>7</sup> published.
Research Resources	Delirium research hub	Currently includes 1510 human and 255 animal studies. Searchable by investigator, study status, data types and availability of resources NIH-sanctioned Resource Sharing Site.
	Delirium bibliography	Currently includes more than 5600 articles readily accessible via NIDUS website; more than 100 views per month.
	Investigator of the month	The research of both junior and senior delirium researchers from around the world is highlighted to increase awareness and potential collaboration.
Measurement and Harmonization	Delirium instrument information cards	Developed for more than 45 pediatric/adult delirium screening, diagnosis and severity measures. Each referenced web-available card includes instructions for use and COSMIN quality ratings.
	Harmonization	Development of a web-based cross walk tool for the harmonization of different delirium measurement instruments and severity scores. The results of these efforts have been published in two recent papers. <sup>4,5</sup>
Pilot and Exploratory Studies	Annual pilot awards	Investigators from around the world are encouraged to collaborate with researchers from another institution to submit a letter of intent (LOI) for a 1-year pilot study focused on one or more of NIDUS priority areas (delirium ↔ ADRD, measurement, pathophysiology, and treatment). LOI awardees receive reviewer feedback and are provided with biostatistical mentoring to strengthen their final application. To date, more than 20 pilot awards of up to \$50,000 each have been awarded.
Career Development, Dissemination and Outreach	Bootcamp	Across the 11 annual fall bootcamps (2013–2023) conducted to date, a cumulative total of 126 diverse and interprofessional mentees (junior investigators) from 9 countries have completed the 3-day Bootcamp run by 14 senior and 4 junior (prior Bootcamp graduates) faculty. As part of their Bootcamp application, each mentee must submit a one-year career development research proposal that is reviewed by another mentee and two faculty and discussed during a NIH-style mock study section. Each mentee attends multiple interactive didactic sessions led by senior faculty, participates in networking sessions and receives both formal and informal mentoring.
	Mentoring webinars	More than 36 mentoring webinars (6 per year) have been delivered by senior researchers in the field on a variety of clinical-translational delirium research topics.
	Blogs	More than 80 research blogs have been published over the past 8 years, many authored by prior Bootcamp alumni or pilot awardees.

Abbreviations: AD/ADRD, Alzheimer's disease and related dementias; ADS, American Delirium Society; COSMIN, COnsensus-based Standards for the selection of health Measurement Instruments; NIH, National Institutes of Health.

<sup>a</sup>From September 2016 to December 2023.

<sup>b</sup>NIDUS-I and NIDUS-II cores/task forces have been merged together into four groups.


the renewal focused on utilizing the existing infrastructure to advance science in dedicated ways, through harmonization projects, collaborative working groups, and White Papers. The NIDUS Delirium Boot Camp, now entering its 12th year, was renewed under a separate R13 mechanism (R13AG072860, MPI: J Devlin, J Busby-Whitehead) and has provided an invaluable career development resource that has inspired and trained new generations of delirium researchers. NIDUS alumni (former Boot Camp and Pilot awardees) remain integrally involved and engaged with NIDUS, serving as Boot Camp faculty, pilot grant referees, symposium moderators, coauthors of White Papers, and so forth.

NIDUS has faced numerous challenges. Pilot grants have been relatively small (\$40–50,000) and limited in number (typically funding <5% of submissions). Supplements were awarded in the first cycle to increase the number and size of pilot awards; however, these were not available during the renewal. Long-term sustainability of the network is a major issue without dedicated NIH funding. Parts of the infrastructure might be maintained through different mechanisms, such as professional societies and/or philanthropy, but supporting the synergistic whole may be challenging. Heightened international funding restrictions by NIH, along with a prolonged vetting process, hinder international pilot awards and collaborative projects. Data use and sharing agreements, so essential for harmonization or collaborative work, can pose nearly insurmountable obstacles and delays for junior investigators. Unfortunately, all of these issues work against the overarching goal of developing and nurturing collaborative research.

Despite the challenges, NIDUS remains a strong, vibrant, and innovative research network. The greatest strength of NIDUS is the enormous dedication and commitment of the NIDUS leaders and mentees. Moreover, the robust infrastructure created and continually improved over the past 8 years provides valuable research resources and events. The NIA set the stage for innovation and collaboration through the development of research networks in its visionary call in 2015, and NIDUS has risen to fulfill the vision and to meet the call for advancing the field of delirium research globally.

### FUNDING INFORMATION

This paper is supported in part by Grant Nos. R33AG071744 and R13AG072860 from the National Institute on Aging.

John W. Devlin PharmD<sup>1,2</sup>   
 Richard N. Jones ScD<sup>3</sup>  
 Sharon K. Inouye MD, MPH<sup>4,5</sup>

<sup>1</sup>Department of Pharmacy and Health Systems Sciences, Bouve College of Health Sciences, Northeastern University, Boston, Massachusetts, USA

<sup>2</sup>Division of Pulmonary and Critical Care Medicine, Brigham and Women's Hospital/Harvard Medical School, Boston, Massachusetts, USA

<sup>3</sup>Departments of Psychiatry and Human Behavior and Neurology, Warren Alpert Medical School, Brown University, Providence, Rhode Island, USA

<sup>4</sup>Hilda and Arthur Marcus Institute for Aging Research, Hebrew SeniorLife, Harvard Medical School, Boston, Massachusetts, USA

<sup>5</sup>Division of Gerontology, Department of Medicine, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Massachusetts, USA

### Correspondence

John W. Devlin, PharmD, Northeastern University, 360 Huntington Avenue, R216 TF, Boston, MA 02115, USA.

Email: [j.devlin@northeastern.edu](mailto:j.devlin@northeastern.edu)

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### ORCID

John W. Devlin  <https://orcid.org/0000-0003-1751-9012>

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