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Developing senior leadership for clinical and translational science

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The fifth in a 5-part series on the clinical and translational sciences educational pipeline, this paper focuses on strategies for developing leadership capacity among senior faculty and administrators responsible for clinical and translational science (CTS) research. Although progression in academic rank recognizes scientific excellence in research or scholarship, neither disciplinary training nor experience alone prepare senior faculty for the leadership challenges they inevitably face. Yet these faculty are increasingly responsible for multidisciplinary teams working within complex organizations with unclear or conflicting incentives that demand innovation. In academic health centers with Clinical and Translational Science Awards (CTSAs), investing in leadership often includes career development support in the CTSA education and training pillar programs. Only a few CTSAs have taken an intentional approach to developing senior leadership capacity, however, and still fewer have focused specifically on building such capacity for current CTS leaders within the context of a growing emphasis on team science. This manuscript explains the need for senior leadership training and describes an established example of such a program, the year-long Leadership for Innovative Team Science program for senior CTS researchers at the University of Colorado. The development of the program over time, topical elements, and participant perspectives are provided.

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Introduction

The work of senior scientists today increasingly involves positions of greater responsibility not only for their own work, but also for the work of other scientists and staff, and for programs. These positions include managing large laboratories or research programs, clinical services, academic departments, schools, centers, and other units—work that contributes in no small way to the quality and productivity of the institution as a whole. The requirements of these leadership roles become even more demanding in the context of today's multi-faceted scientific workforce and increasing fiscal pressures. CTSA-situated workforces, for example, function within complex academic health centers and operate in competitive and dynamic local, national, and international markets for science and health care. Moreover, CTSAs formally recognize and require team science to span new bridges and overcome old boundaries. Twenty-first century science is driven by relational processes, rather than solo "eureka" moments in individual labs [1].

Leadership for team science requires substantial skills, yet few clinical and translational science (CTS) leaders have received formal training in management or leadership that simply was not part of past curricula of graduate or professional training programs [2]. The last, but essential, section in the pipeline that is needed to produce the clinical and scientific workforce of the future is leadership training for senior scientists. This is the group who not only directs the majority of large-scale team science projects, but who also ensures that younger scientists are prepared for these same challenges in their time. As senior scientists face these challenges and continue to pursue their own career growth, these talented individuals need evidence-based strategies for managing people working on complex tasks and for leading organizations. Major barriers to such training stem from competing pressures and increasing demands on time, including longer transitions to research independence, competitive

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funding environments, reduced public support for research institutions, increased class sizes in resident and medical education programs, and clinical environments with heavy patient loads. What many younger faculty do not always realize is that, simply by virtue of their training and professional status, they will be perceived as leaders. Expectations to fulfill formal leadership roles will be increasingly inescapable as they move through their careers. Formal leadership training programs designed for clinical and translational scientists represent a tremendous need as they provide invaluable opportunities to learn and practice the skills of leadership before faculty are under the spotlight of those leadership roles.

In many academic health centers, substantial investments have been made in programs aimed at supporting career development as a goal of human capital development for the 21st century workforce. Most of these efforts have focused on trainees and junior (early career) faculty, with leadership training needs for more senior (mid and later career) faculty commonly outsourced to association programs or such specialized programs as Executive Leadership for Academic Management [3]. CTSA organizations usually reflect this same pattern of focusing on junior faculty, offering occasional seminars or workshops rather than focused and sustained programming to move senior clinical and translational scientists through structured and comprehensive leadership training. The Colorado Clinical and Translational Sciences Institute's (CCTSI) Leadership for Innovative Team Science (LITeS) program appears to be a notable exception in this regard. Specifically, LITeS ensures that those in leadership roles have opportunities to invest in the development of skills related to self-management, team management, and change management. By virtue of their engagement in such professional development, CTS leaders are serving as examples regarding the value of such training for those who will follow. This is referred to as the "leadership engine" model, as these same skills in leadership (e.g., team management) not only help faculty fulfill administrative expectations, but also support research productivity, thus promoting retention and enhanced mentorship capacity at the associated institution [4, 5].

This paper is the fifth in a 5-part series on the clinical and translational science educational pipeline. In addition to providing strategies for developing the leadership capacity of senior CTS faculty, we will describe the LITeS program, initiated by the CCTSI in 2008. LITeS represents the first major effort by a CTSA to address the senior leadership training gap described above, and as such, may provide a useful example for other CTSA programs that are attempting to address the full spectrum of education, training, and career development needed to prepare a robust CTS workforce.

Background

The case for Team Science as a distinct approach with distinguishable characteristics has been well established over the past decade. Wuchty *et al.* [6] documented that across virtually all fields of knowledge—regardless of funding and other systematic differences, team approaches to research are resulting in both higher productivity and higher impact. Based on an analysis of 19.9 million publications and 2.1 million patents, they documented the dramatic shift from the preeminence of solo authorship of critical and influential findings in the 1950s to the collective work and work products that dominate scientific advances today. Of course, the expectations for working collaboratively also have increased; consequently, we see both incentives and requirements for collaborative work incorporated into funding mechanisms.

Using the perspective of community psychology, Tebes *et al.* [1] described the relational process that is now expected for the conduct of science, and carefully articulated the new necessity for discovery through interpersonal transactions and active engagement of scientists both across disciplines and with the public. The acceptance of team science as the norm, however, has not meant that the road has always been smooth. Working in teams, which are often multidisciplinary, introduces complexities at a level that the solo scientist avoids, and knowing what needs to be done does not necessarily imply that we know *how* it should be done. Only recently have we begun to see publications, and even investigations, focused on the process needs of scientists working in and leading collaborative efforts [7–11].

Some of this more recent work has branded itself as the "science-of-team-science," seeking to explore variables that influence, either positively or negatively, the effectiveness of team science. This work has tended to focus on external factors and the structure of research programs—even the structure of research problems—rather than on how scientists work together at an interpersonal level to accomplish the goals of their research [8, 9, 12–15]. There is no question that the ways in which we organize to carry out our work, and the settings in which we conduct that work, have a tremendous influence on our ability to efficiently conduct research and achieve results. These analyses go a long way towards supporting an understanding of the complexities and challenges of science today, yet they do not address the basic mechanisms of human interaction that allow us to manage and support those who are involved in the scientific enterprise [16].

In contrast to those more structural approaches, Bennet and Gadlin [10] drew primarily on the literature of organizational psychology and management science to understand the skills and approaches needed for team science, and they extended the meaning of this work through interviews with scientists working in collaborative teams. They focused particularly on interactions and communications that appear to be essential to successful team science, further characterizing these needs through exploration of the levels of demonstrated interaction and integration. They suggested that the higher the level of integration required to meet the goals of a scientific research team, the greater will be the need for leadership and teamwork skills. The authors emphasize "trust" as the sine qua non for building effective collaborations at any level of complexity, and they used the time-honored steps in team development that were articulated by Tuckman in 1965 as an explanatory framework for creating and supporting group cohesion [17]. This work, and an earlier manual for which Bennet and Gadlin also are authors [18], comprise much of the published guidance currently available for training in the interpersonal dynamics and skills necessary for leading team science. In addition to trust, this work also emphasizes self-awareness and communication in order to develop a shared vision, strategically build a team, and promote healthy debate.

In considering the needs for team science leadership in the clinical and translational sciences at the University of Colorado Anschutz Medical Campus and its affiliated campuses and organizations, we began with a foundation of basic leadership principles and skills, such as those described by Bennet and Gadlin [10]. The Cleveland Clinic Academy also has used a leadership competencies approach in their cohort-based programs [19].

LITeS

Program Goals

The aim of the LITeS Program is to enhance effective leadership for team science by providing training in exemplary leadership skills for CTS leaders; providing focused opportunities to practice and reflect on those skills most critical for team science; and creating learning communities of CTS researchers who will foster innovation and mutually support effective leadership. The need for this program was underscored by the results of a WESTAT national survey of CTSA-supported trainees and their mentors, which identified the need for more training in team-based science as the primary deficiency in most CTSA programs [20]. Similarly, the CCTSI recognized the need for such programming and developed the LITeS program in its Education,

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Training, and Career Development Pillar. The LITeS program aligns with persistence approaches that focus on (1) supporting successful educational/career transitions; (2) providing meaningful opportunities to practice skills in salient, applied contexts; (3) fostering mentorship and peer support; and (4) supporting identity formation as leaders [4].

LITeS provides an introduction to leadership theory, an understanding of one's strengths related to leadership, real skills for management and leadership tasks, experience and skills for teamwork, guidance in creating a leadership development plan, and coaching to ensure success in achieving leadership goals. Utilizing a workshop format that emphasizes experiential learning, the program provides a unique environment for exploring individual strengths and leadership development needs (supported by standardized assessments), understanding and practicing critical leadership and team building skills, and building support networks to sustain intentionality and development of more effective leadership behaviors.

Target Population and Recruitment

LITeS enrollment targets senior faculty involved in collaborative research and/or in positions related to training the next generation of CTS leaders. Senior leadership of the CCTSI comprised the first LITeS cohort. Subsequently, senior faculty leaders who direct collaborative research centers, programs, or projects were targeted including directors and mentors in externally funded training programs (T32 and K12 directors, and K24 recipients), along with graduate program chairs, department and division chairs, and deans. Deans of the 6 schools and colleges on the Anschutz Medical Campus have completed LITeS, as have senior hospital leaders. As a result of the program's broad reach, LITeS impacts not only the leadership that is currently in place, but also the quality of the next generation of institutional leaders.

Over 9 years, LITeS has enrolled 227 individuals in cohorts of about 25 participants (range 23–35). Participation has involved roughly equal numbers by gender and by training degree: 52% with PhD and 48% with MD, or other professional doctoral degrees (e.g., DVM, DDS, PharmD); approximately half were basic translational and half clinical researchers. Nearly 75% have been at full professor academic rank, with increasing participation over time by associate professors who hold significant leadership roles. Women participants consistently outnumber men slightly (53%–47%) despite lower representation in senior academic ranks and leadership roles as has been demonstrated nationally [21].

Program Structure

The program is comprised by four 2-day sessions scheduled over the academic year, with the first session held off campus. Participants devote an estimated 25 additional hours of additional time to team project work, reading and preparation, and individual professional and peer coaching sessions. Team projects and coaching were added to the program in 2011. Participants are asked to commit to attending all meeting dates before acceptance into a cohort. Participation is considered an honor, as nominations are formally solicited from chairs and alumni, and applications are solicited and chosen by program directors. Participation is not financially supported with release time and is voluntary; there are no participant fees. Public commitment and accountability to the program cohort were implemented in order to encourage full participation; virtually no attendance problems have occurred.

In total, 4 major learning strategies are employed in LITeS: (1) assessment and feedback, including coaching, for understanding of individual strengths, skills, and talents; (2) training activities to develop interpersonal competencies related to people management, team building, and leadership; (3) structured simulations and practice of skills for management of tasks and programs, including completion of a team project; and (4) reading and reflection to enhance integration of learning. Strength-based professional development planning and goal setting exercises involve group activities, as well as peer coaching sessions. All participants keep a journal of their learning experiences; questions to prompt journal entries are provided with each session agenda.

Standardized, evidence-based qualitative and quantitative assessments provide individual feedback in such areas as personality and work styles, leadership style, conflict modes, emotional intelligence, influence styles, and responses to change, as well as team effectiveness. Since 2013, all participants have engaged in a standardized 360 feedback on leadership skills that involves completion of assessments by peers, direct reports, and those to whom participants report. We use validated tools that are affordable and offer electronic scoring options when possible, favoring instruments that can provide norms for populations similar to our LITeS cohorts, if available. We also have chosen to use tools supported by our program trainers in order to avoid higher training and certification costs for assessments. Participants learn to effectively use their strengths in the areas assessed and explore with one another how individual differences in such skills can affect interactions and, ultimately, group productivity and effectiveness. Additional trainings have been developed in response to participant input, including such topics as meeting management, challenging communications, respectful workplace, peer coaching, giving and receiving feedback, time management, delegation, intergenerational and gender differences in communication, and skills for negotiation.

Team projects were initiated in 2011; since 2013, the topics have been generated by University leaders (e.g., chancellor, provost, deans, or others) who have served as sponsors and expert consultants to the teams during the program. Teams report at each quarterly session, gain input from other cohort members and program faculty, and make formal presentations of their work at the final LITeS session to an audience of invited stakeholders, including the sponsors and other senior campus and University leaders.

Program Perspectives

A post-program survey is administered by The Evaluation Center at the University of Colorado Denver. The survey includes both quantitative (fixed-choice response) and qualitative (open-ended) items to inform ongoing quality and process improvement and to assess program outcomes consistent with other program competency evaluations [16]. We assess self-reported knowledge gains for session topics that address team science skills and leadership concepts. Significant knowledge gains have been reported for virtually all topics measured in structured evaluations (not reported). Participants reported an eagerness to share concrete strategies to improve such skills as teamwork and meeting efficiency and also reported implementing newly learned skills immediately. Their responses to the program are best reflected in their own words:

> *"Learned a lot about how effective teams function, what they seem to do well (or not as well), and how to tailor leadership towards getting the most out of teams I am associated with or lead."*

> *"It forced me to realize the time and effort it takes to become an effective leader."*

> *"Met a lot of high-performing skilled people; hope to be able to draw upon their expertise in the future as I develop my own leadership skills and style."*

> *"This can be a lifelong endeavor—I will seek career development for myself more often.*

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"Regarding leadership, I learned this type of training should be offered earlier in professional careers than it is typically."

The opportunity to interact with investigators from multiple schools and disciplines is reportedly one of the most impactful aspects of the program. Respondents also appreciated being able to contribute to the executive decision-making process via team projects and reported that it gave them greater insight into the way decisions had been made in the past. Respondents reported the establishment of expanded social networks—social capital that they could draw upon for change management—and a stronger sense of connection to the university as a result of participating:

"LITeS really made me feel more engaged with the university. Meeting bright leaders from other schools and settings gave me greater connection [to] and confidence in the Anschutz Medical Campus."

"Just getting to know a diverse group of people across the institution cemented my relationship to it."

"A diversity of people in a team does lead to better work. We depended on the strengths of each team player in a different way, which made for an excellent process and report."

LITeS participants were asked how they had applied the knowledge and/or skills gained from participation in the program. Respondents reported specifically using conflict resolution skills gained in the program to manage difficult situations within their departments. Respondents reported using new skills to better manage their groups. Others reported that the skills developed in LITeS supported their effectiveness during interdepartmental meetings:

"I drew up a negotiation check-list based on our discussions and refer to it every time I go into a session that will require negotiation … After our session on project management, I reviewed a faculty-wide project I am working on. I realized that I had missed some key elements – not all stakeholders were involved, representation of all constituents was not in the governance structure, [and a] change strategy was missing. I went back and revised all of these in the project."

"I feel like I am now more cognizant of the impact of changes, etc., on others on our campus. I am committed to continue to build bridges between all of our campus colleagues. This will serve to improve our constituents and our community.

The connections also generate new clinical and translational science, as in the following case described by a participant:

"While in LITeS, I learned that a colleague was working on a disease site that I had only recently started to work on. Tools developed in their lab can be used to address our questions, and we envision submitting a multi-PI R01 together."

Within one recent cohort alone, a remarkable 30% (9 of 28) reported that they had developed new collaborations through their participation in LITeS; this is central to the goals of the CTSA program [22]. This connectivity is vital to supporting academic persistence. It also suggests a pipeline effect by modeling good practices for trainees and other faculty. As an example of the diffusion of LITeS skills and knowledge, LITeS participants have reported sharing LITeS skills at lab retreats and faculty functions.

Recommendations and Questions

Based on our formative assessments after sessions, individual coaching conversations with participants, and program evaluation interviews and focus groups with education, training, and career development participants, we have derived several hypotheses about the "secret sauce" or highly effective elements of a CTS leadership program. They are presented in Table 1.

Using formative assessment of program elements, the LITeS curriculum is adapted each year in response to the feedback of the most recent cohort in order to ensure the relevance of our training and for varying populations. One example of this is the topic of workplace diversity. A critical element in pipeline programs [4], topics related to diversity and inclusion belong in faculty leadership training experiences as well. During LITeS, participants explore the deeper meanings of respect in the workplace, in part because it stimulates reflect on the range of individual and group differences and how diversity can contribute to scholarship and academic leadership. These discussions also have led us to add more specifically-focused content in such areas as gender-based differences in communication and intergenerational expectations, as well as addressing challenges of responding to an increasingly multiracial and multinational society. Through a commitment to ongoing program evaluation and organizational learning, we have identified new questions we wish to pursue about the process of preparing faculty for leadership in clinical and translational research. These are some of the same questions that Stoller posed in commenting about health care leadership training programs at the Cleveland Clinic Academy and more generally [19]. Among these are questions related to the timing and structure, or context, of training.

Although LITeS is focused on senior faculty with leadership responsibilities and on senior academic leaders, participants have recommended that similar program offerings be made available at earlier stages of the pipeline to support more junior faculty, or those whom we might term, "emerging leaders." Although LITeS now reaches into the mid-career group of faculty, it is possible that a career-spanning approach is needed, with training available at several points over the course of an individual's career.

The question of context has to do with whether training should be conducted within an individual's department, division, or other workgroup. There is value in gaining shared training, a common mental model and even shared nomenclature within a group or existing team engaged in team science. Likewise, there is value, and possibly greater psychological safety, in training among a cohort of people who are outside a person's own academic unit or reporting relationships.

Table 1. *Highly effective elements of clinical and translational science (CTS) leadership development programs*

1	Explicit reference to the context of clinical/translational science and related responsibilities
2	Standardized assessment techniques with group debriefing and personalized feedback
3	Interprofessional, multidisciplinary cadre of participants
4	Emphasis on experiential learning, but reflecting a data-driven rationale for content
5	Fast-paced, practical and immediately applicable
6	Adult learning approaches that acknowledge and utilize participants' existing and developing knowledge and skills
7	Training in, and employment of, peer coaching strategies
8	Availability of professional coaching, to the extent possible
9	Engagement in meaningful team-based projects to solve complex, real-world problems relevant to team science and CTS
10	Sufficient duration (at least 6 months); permits participants to identify as a cohort and build enduring professional relationships and networks

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The relative value of these approaches remains an empirical question. CTSA programs consistently are designed across schools and departments to leverage the benefits of the latter. This also builds interdepartmental professional networks that evaluation data suggest participants find so valuable as they work to support interdepartmental and institutional change initiatives. Recent requests for a LITeS-like program for intact teams suggest that this is an issue we need to address, and the current LITeS cohort includes one such intact team. Is it the full team that needs to be trained, rather than only selected individuals within the team? This is an area that we hope to learn more about as our first intact team experiences LITeS.

A final question that begs consideration is that of the benefit to the organization and to the clinical/translational research enterprise. Are we truly seeing more collaboration and a realization of Team Science? Are the new networks generated actually generating new research collaborations and enhanced research productivity? Does training to build individual leadership skills result in greater efficiency and productivity of research teams? Does it influence future generations of scientists? Does it enhance retention and recruitment of CTS researchers at all ranks? How can we feasibly but rigorously study these impacts? To do so, requires documenting more than proximal outcomes (vis-à-vis self-reported measures) and an investment in a longitudinal, mixed-method approach. Such an investment would not only contribute to the fields of CTS education, training and career development and team science, but would also advance the field of leadership development, more generally.

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Disclosures

The authors have no conflicts of interest to declare.

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