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| **Table 1: Barriers and Strategies of Developing A Pediatrician-Scientist Program in Residency Training by Bolman and Deals' Four Frames of Organizational Functioning and Leadership", as Identified by Experts in Research and Education at the 2019 Pediatric Academic Societies Meeting Scholarly Session** |
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| **Bolman and Deal Organizational Frame** | **Definition of Frame** | **Barriers & Strategies** | **Recruitment** | **Program Structure & Curricula** | **Mentorship** | **Resources** |
| **Structural** |   | Barriers | -Extended length of training including subspecialty training-Shrinking positions for physician-scientists in academic pediatrics-reduced financial support for residency expansions | -Loss of resident FTE\* for ABP ARP/IRP\*\*-Difficulty achieving optimal schedule for research skills training within training program schedule -Limited number of physician-scientist residents within the program impedes adoption of long-term solutions-Inability to provide call-free time on research months | -Availability of qualified mentors, with mentorship experience of physician-scientists | -Limited research infrastructure-Lack of financial support for research and/or related activities |
| Strategies | - Strategic planning for career development during residency to reduce transition time from fellowship to junior faculty-Hiring PGY-2 transfer residents to fill anticipated vacancies expected for physician-scientist residents on ABP ARP/IRPs-collective advocacy to hospital systems for research in residency | -Dedicated slots (outside of complement) to alleviate scheduling constraints.-Facilitating community building between programs such as at national meetings | -Consider team mentoring for collective expertise and improve reliability-Creation of national network of mentors to help fill gaps in local perspective/expertise-Increase vertical mentoring to engage PSTP% and faculty pediatric-scientists with MSTP trainees | -Collaborate with partnering/collaborating institutions-Support physician-scientist residents to pursue research experiences at these institutions-Advocate for continued support of key programs such as national PSDP\*\*\* and R38$. |
| **Human****Resources** |  | Barriers | -Limited number of MSTP graduates pursuing pediatric residency program  | -Lack of protected effort for faculty engaged/planning physician-scientist resident curricular activities (i.e., seminar planning, recruitment, etc.) | -Lack of training of house staff faculty mentors on unique needs of physician-scientist trainees  | -Lack of research faculty to mentor physician-scientist trainees |
| Strategies | -Work to pair and individualize, research track residency to fellowship to create a workforce pipeline | -Salary, academic and recognition incentives towards promotion for faculty with research careers who devote time and effort mentoring future pediatrician scientists -Creation of APD roles with special expertise in the needs of physician-scientists | -Focus on larger pool of trainees beyond MSTP# residents to include MDs who discover research interest during residency/fellowship-Expand workforce to create overlaps in resources for sharing co-mentoring from investigators with large infrastructures-Train mentors to understand work/life complexity-Establish commitment and skills to enable successful mentoring-Develop critical mass of highly qualified mentors for sustainability-Expand number and diversity of physician-scientist role models in regards to types of research (basic, clinical, socio-behavior research) and ethnicity  | - Recruit research faculty with a track record of mentorship of clinician-scientist trainees |
| **Political** |  | Barriers | -Institutional competition with other specialties with better or more widely appreciated track records for physician-scientists | -Lack of coverage during protected research time -Perception by residency leadership and co-residents that there should be equal clinical responsibilities for all residents- Conflicting priorities of meeting clinical needs versus supporting research efforts-Limited funds to protect the research/training opportunities for residents  | -Struggle with demanding schedule of trainees and mentors-Pressure on faculty to generate clinical revenues in light of shrinking federal research funding-Lack of protected time and formalized recognition for mentoring despite high mentoring needs of aspiring physician-scientists | -Absence of residency slots protected for research-Lack of financial resources to provide individualized support of trainee for work-life balance |
| Strategies | - Support vertical integration of MSTP activities with research residency to attract internal candidates- Develop tailored interview day, meeting with leaders (chairs, program directors) reception for community exposure | -Bring in new residents as PGY2s to specifically cover the research residents that transition to protected research time -Loan repayment -Incentives for research faculty and GME faculty who protect the needs of these residents | -Enhance value and recognition to mentorship (incentive, protected time, promotion)-Expanded internally funded opportunities for physician-scientist | -Create coverage structure to protect time for research for physician-scientist residents-Implement flexible support programs such as Research Assistant, daycare, and other flexible support tailored to individual trainee needs |
| **Symbolic/Cultural** |  | Barriers | -Lack of Reputation/New program, -Lack of defined expectation of trainees during recruitment for “successful completion of physician-scientist training” | -Silo effect: Lack of sense of belonging to broader physician/scientist community within the same institution -Implicit bias that unequally values different individuals/approaches in science  | -Absence of supportive institutional culture to value the contribution of dual physician-scientist mentors-Attrition of existing physician-scientists due to funding struggles- Perceived universal funding struggles - Lack of diverse role models | -Unsettled community/culture for physician-scientists |
| Strategies | -Advertise/publicize recruitment efforts in advance and through various media | -Participation in broader university communities for physician/scientist events -Creation of formal tracks to symbolize to house staff community unique training structure/support needed for physician-scientists-Ongoing training of mentors and community to value diverse pediatrician-scientist workforce and approaches. | -Emphasize the value and contribution of physician-scientists institutionally through leadership and cultural shift-Foster robust collaboration between scientists, physicians, and physician-scientist community to promote acceptance and collegiality | -Promote networking social/events- Create internal pilot/bridge funding award mechanisms for MDs pursuing physician-scientist career to enhance physician-scientist community |

\*\*ABP ARP/IRP - American Board of Pediatrics Alternative Research Pathways (Includes Accelerated Research Pathway/Integrated Research Pathway/Individualized Curriculum)

\*FTE- full-time employee

#MSTP- Medical Scientist Training Program

\*\*\*PSDP - Pediatric-Scientist Development Program

%PSTP- Physician-Scientist Training Program

$R38- NIH Grant- Stimulating Access to Research in Residency (StARR R38)