OMB No. 0925-0001 and 0925-0002 (Rev. 09/17 Approved Through 03/31/2020)

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| **BIOGRAPHICAL SKETCH** | | | |
| NAME: Becich, Michael J | | | |
| eRA COMMONS USER NAME (credential, e.g., agency login): Becich | | | |
| POSITION TITLE: Chairman and Professor, Graduate Faculty, Department of Biomedical Informatics, University of Pittsburgh | | | |
| EDUCATION/TRAINING  *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)* | | | |
| INSTITUTION AND LOCATION | DEGREE  *(if applicable)* | Completion Date  MM/YYYY | FIELD OF STUDY |
| Northwestern University, Evanston, IL | BA | 06/1977 | Biology |
| Northwestern University, Chicago, IL | MD, PhD | 06/1984 | Medicine and Experimental Pathology |

**A. Personal Statement (from over 160 publications)**

Dr. Becich is Distinguished University Professor and inaugural Chairman of the Department of Biomedical Informatics at the University of Pittsburgh School of Medicine. He is jointly appointed in Pathology, Computing/Information and Clinical/Translational Research. He is Associate Director for Cancer Informatics for the UPMC Hillman Cancer Center (Hillman). Dr. Becich trained at Washington University, practiced as an Anatomic Pathologist for over 30 years and is an expert in Genitourinary Pathology. Dr. Becich’s research interests are focused on the interface between clinical informatics and bioinformatics with a particular focus on translational research resources, particularly tissue banking informatics. His research is funded by the CDC, NCATS, NCI, NHGRI, NHLBI and NLM and includes clinical phenotyping of patients for genomic/personalized medicine and clinical informatics with a special emphasis on data sharing. Dr. Becich has over 20 years of research experience in collaborative research projects and team science grants, many of which have involved biorepositories, genomic and clinical data sharing, and has contributed many impactful articles in the area of web portals, data management, research collaboration and coordination, biorepositories, bioinformatics analysis, genomics and clinical annotation of shared data sets.

Dr. Becich is also PI for the National Mesothelioma Virtual Bank (NMVB) and has deployed innovative and sustainable infrastructure to link this biospecimen and clinical data (phenotype) network to three other national initiatives (PCORI Clinical Data Research Network – funded since 2014, NCATS Accrual to Clinical Trials network – funded since 2014 and the new Precision Medicine Cohort funded since 2016). He is a national leader in tissue banking, honest broker practices, HIPAA compliant de-identification of clinical data and the accompanying biomedical informatics tools to enable translational research utilizing biospecimens.

Dr. Becich has mentored several faculty and trainees in the field of biomedical informatics. He has mentored several K-awarded faculty. Examples include: Xia Jiang, PhD, K99-R00, currently tenured Associate Professor; Richard Boyce, PhD, K12, currently tenured Associate Professor; Steven Handler, MD PhD, K12, currently tenured Associate Professor, and Songjian Lu, PhD, K99-R00, currently tenure track Assistant Professor; as well as others he has mentored, serving on thesis committees and other faculty development roles. His faculty mentees include Doug Fridsma, PhD, CEO and President of AMIA; Bill Hogan, PhD, Professor of Health Outcomes and Biomedical Informatics and Director of Biomedical Informatics at the University of Florida; Rebecca Jacobson, MD MSIS, Chief Analytics Officer of UPMC Enterprises and Wendy Chapman, PhD, Chairman and Professor of Biomedical Informatics at the University of Utah. Dr. Chapman was elected to the National Academy of Medicine this year and was concurrently award the Lindbergh Award for Innovation in Informatics, the most prestigious award in Biomedical Informatics.

Training in my lab and in my department allows for a diverse and multidisciplinary experience. Trainees develop skills in biomedical and translational informatics, bioinformatics, clinical informatics, imaging informatics, machine learning/artificial intelligence and public health (population) informatics. Trainees have exposure to intellectual perspectives that are welcome from college, graduate students and postdocs alike and are provided opportunities to mentor high school, undergraduate and health sciences student from our pipeline programs. I encourage my trainees to actively engage in deeply collaborative projects, and coordinate their attendance and presentations in symposia in the area and at national meetings. Trainees learn rigorous and unbiased experimental design, methodology, analysis, interpretation and reporting of results. A central training goal is to help trainees obtain their Ph.D. degrees in a timely fashion with the skills, credentials and experiences to transition into careers as physician-scientists who are expert in investigation. I meet weekly with trainees one on one and also in my lab group meetings for discussions that not only review their work but also support each trainee’s career decisions and trajectory in keeping with their skills, interests and values. Research results are reported in a timely manner in high- quality peer-reviewed journals, reflecting high standards of scientific integrity in the research.

My Department under my leadership as Chair, promotes an inclusive and supportive scientific research environment and have several diversity pipelines of junior trainees that allow graduate students to act as mentors to under-represented in STEMM (Science, Technology, Engineering and Math in Medicine) including our Hillman Summer Academy, the Computer Science, Biology and Biomedical Informatics (CoSBBI) program as well as our Internship in Biomedical Research, Informatics, and Computer Science (iBRIC) programs. These three pipeline programs are funded by the Doris Duke Foundation, NCI and NSF. These grants include the NCI R25 Youth Enjoy Science (YES) program (the largest award of its kind in the US) and a $10M NSF Alliance program. The Hillman Academy, was named one of the top 100 educational innovations in the world in 2020 by Hundred.org. This work has also led to the establishment of the Broadening Equity in STEM Center at the University of Pittsburgh.

Dr. Becich has been a mentor to over 45 graduate students, fellows and junior faculty; several of which have leadership positions at academic health centers. He is a member of the Executive Committee of the NLM T15 Pittsburgh Biomedical Informatics Training program since 2006. Dr. Becich is well qualified to act as a mentor to both pre-doctoral and post-doctoral fellows and will provide scientific, professional mentoring and job placement connections for our NLM trainees. Publications he has authored with trainees (**bolded**) are:

1) **Ye Y,** Boyce RD, Davis MK, Elliston K, Davatzikos C, Fedorov A, Fillion-Robin FC, Foster I, Gilbertson J, Heiskanen M, Klemm J, Lasso A, Miller JV, Morgan M, Pieper S, Raumann B, Sarachan B, Savova G, Silverstein JC, Taylor D, Zelnis J, Zhang GQ, Becich MJ. Open Source Software Sustainability Models: Initial White Paper from the Informatics Technology for Cancer Research Sustainability and Industry Partnership Work Group. arXiv 2020. <https://arxiv.org/abs/1912.12371>

2) **King AJ**, **Fisher AM**, Becich MJ, Boone DN. Computer Science, Biology and Biomedical Informatics academy: Outcomes from 5 years of Immersing High-school Students into Informatics Research. J Pathol Inform. 2017 Feb 28;8:2. doi: 10.4103/2153-3539.201110. eCollection 2017. PMID: 28400991 PMC ID: 5359992.

3) Uppal R, Mandava G, **Romagnoli KM, King AJ, Draper AJ,** Handen AL**, Fisher AM**, Becich MJ, **Dutta-Moscato J**. How can we improve Science, Technology, Engineering, and Math education to encourage careers in Biomedical and Pathology Informatics? J Pathol Inform. 2016 Jan 29;7:2. PMID: 26955500. PMCID: PMC4763503

4) **Dutta-Moscato J**, Gopalakrishnan V, Lotze MT, Becich MJ. Creating a pipeline of talent for informatics: STEM initiative for high school students in computer science, biology, and biomedical informatics. J Pathol Inform. 2014 Mar 28;5(1):12. PMID: 24860688. PMCID: PMC4030307

**Complete List of Published Work in MyBibliography:** <http://www.ncbi.nlm.nih.gov/pubmed/?term=becich>

**B. Positions and Honors - Positions and Employment**

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| --- | --- |
| 2006 - Present | Chairman and Professor, Graduate Faculty, Department of Biomedical Informatics, |
| 2004 - 2006 | Vice Chair of Pathology Informatics, School of Medicine, University of Pittsburgh |
| 2002 - 2008 | Professor of Pathology, Information Sciences and Telecomm, Grad Faculty |
| 2000 - 2006 | Director, Department of Pathology, Center for Pathology Informatics, Univ of Pgh |
| 1996 - 2002 | Associate Professor/Graduate Faculty, multiple 2ndary appointments |
| 1991 - 1996 | Assistant Professor/Graduate Faculty, Division of Cellular and Molecular Pathology |
| 1989 - 1991 | Instructor, School of Medicine, Washington University, St. Louis, MO |
| 1987 - 1989 | Fellow, School of Medicine, Washington University, St. Louis, MO |
| 1984 - 1987 | Resident, School of Medicine, Washington University, St. Louis, MO |

**Other Experience and Professional Memberships**

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| --- | --- |
| 1990 - Present | Member, College of American Pathologists |
| 1990 - Present | Member, American Society of Clinical Pathologists |
| 1995 - Present | Member, American Association for Cancer Research, Inc. |
| 1996 - Present | Member, American Medical Informatics Association |
| 2000 - Present | Member, Association for Pathology Informatics |

**Honors**

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| 1986 - 1989 | National Cancer Institute (NCI) Cancer Biology Fellowship Program |
| 1989 | Fellow of the College of American Pathologists - FACP |
| 1992 | Pathology Teaching Award for Anatomic Pathology, University of Pittsburgh |
| 1999 | Visiting Professor of Pathology, MD Anderson Medical Center, Houston, TX |
| 1999 | Intel Internet Health Hero |
| 1999 | Distinguished Visiting Professor of Pathology, Johns Hopkins Univ, Baltimore, MD |
| 2000 | Quest Distinguished Visiting Professor of Pathology, Harvard University, Boston, MA |
| 2000 | Visiting Professor of Pathology, University of Pennsylvania, Philadelphia, PA |
| 2000 | Distinguished Visiting Pathology Professorship, The Leo Kaplan, Lectureship, UCLA |
| 2006 | Elected Fellow, American College of Medical Informatics (FACMI) |
| 2015 | Distinguished University Professor, University of Pittsburgh |
| 2016 | Benjamin Highman Endowed Lectureship, UC Davis Department of Pathology |

**C. Contribution to Science (from over 150 publications)**

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| 1. | **Pathology Informatics and Computational Pathology**:  In 1991, Dr. Becich founded the Division of Pathology Informatics at the University of Pittsburgh. He is considered one of the pioneers in this area and began the Pathology Informatics Summit (formerly APIII) in 1996 which led to the formation of the Association for Pathology Informatics (API) in 2000. The API has over 350 members and now hosts the Journal for Pathology Informatics. His work has led to the emerging discipline of Computational Pathology which is a knowledge engineering discipline unlocking lab “big data”. | |
| a. | | Tosun AB, Pullara F, **Becich MJ**, Taylor DL, Fine JL, Chennubhotla SC. HistoMapr™: Explainable AI (xAI) for Anatomic Pathology. Adv Anat Pathol. 2020 Jul;27(4):241-250. doi: 10.1097/PAP.0000000000000264. PMID: 32541594 |
| b. | | Louis DN, Feldman M, Carter AB, Dighe AS, Pfeifer JD, Bry L, Almeida JS, Saltz J, Braun J, Tomaszewski JE, Gilbertson JR, Sinard JH, Gerber GK, Galli SJ, Golden JA, **Becich MJ**. Computational Pathology: A Path Ahead. Arch Pathol Lab Med. 2015 Jun 22. PMID: 26098131; PMCID: PMC4996078 |
| c. | | Gullapalli RR, Desai KV, Santana-Santos L, Kant JA, **Becich MJ**. Next generation sequencing in clinical medicine: Challenges and lessons for pathology and biomedical informatics. J Pathol Inform. 2012;3:40. PMID: 23248761; PMCID: PMC3519097 |
| d. | | Yu YP, Landsittel D, Jing L, Nelson J, Ren B, Liu L, McDonald C, Thomas R, Dhir R, Finkelstein S, Michalopoulos G, **Becich MJ**, Luo JH. Gene expression alterations in prostate cancer predicting tumor aggression and preceding development of malignancy. J Clin Oncol. 2004 Jul 15;22(14):2790-9. |
| 2. | **Translational Team Science and Biomedical Informatics:** Founding Chair of Biomedical informatics (2006) at University of Pittsburgh (Pitt) School of Medicine he has mentored several faculty and trainees whom are now leaders in this discipline. A highly cited author in Biomedical and Pathology Informatics, Dr. Becich continues to innovate in team science as a member of the PCORnet Clinical Research Network (9 hubs with over 160 nodes), the NCATS Accrual to Clinical Trials network (48 sites expanding to 62) and the National Mesothelioma Virtual Bank (6 sites expanding to 7). He has also been part of the Big Data to Knowledge Center for Causal Discovery (12 sites) and the Genomic Research in Alpha-1-Antitrypsin Deficiency & Sarcoidosis, Genomic & Informatics Coordinating Center (9 sites) and currently Chairs the Informatics Enterprise Committee of the CTSA program (64 sites). | |
| a. | | Moller DR, Koth LL, Maier LA, Morris A, Drake W, Rossman M, Leader JK, Collman RG, Hamzeh N, Sweiss NJ, Zhang Y, O'Neal S, Senior RM, **Becich MJ**, Hochheiser HS, Kaminski N, Wisniewski SR, Gibson KF; GRADS Sarcoidosis Study Group. Rationale and Design of the Genomic Research in Alpha-1 Antitrypsin Deficiency and Sarcoidosis Study (GRADS): Sarcoidosis Protocol. Ann Am Thorac Soc. 2015 Jul 20. PMID: 26193069. PMCID:PMC4627423 |
| b. | | Cooper GF, Bahar I, **Becich MJ**, Benos PV, Berg J, Espino JU, Glymour C, Jacobson RC, Kienholz M, Lee AV, Lu X, Scheines R; Center for Causal Discovery team. The Center for Causal Discovery of Biomedical Knowledge from Big Data. J Am Med Inform Assoc. 2015 Jul 2. PMID: 2613879 |
| c. | | Amin W, Tsui FR, Borromeo C, Chuang CH, Espino JU, Ford D, Hwang W, Kapoor W, Lehmann H, Martich GD, Morton S, Paranjape A, Shirey W, Sorensen A, **Becich MJ**, Hess R; PaTH network team. PaTH: towards a learning health system in the Mid-Atlantic region. J Am Med Inform Assoc. 2014 Jul-Aug;21(4):633-6. PMID: 24821745. PMCID: PMC4078296 |
| d. | | Bernstam EV, Hersh WR, Johnson SB, Chute CG, Nguyen H, Sim I, Nahm M, Weiner MG, Miller P, DiLaura RP, Overcash M, Lehmann HP, Eichmann D, Athey BD, Scheuermann RH, Anderson N, Starren J, Harris PA, Smith JW, Barbour E, Silverstein JC, Krusch DA, Nagarajan R, **Becich MJ**; CTSA Biomedical Informatics Key Function Committee. Synergies and distinctions between computational disciplines in biomedical research: perspective from the Clinical andTranslational Science Award programs. Acad Med. 2009 Jul;84(7):964-70. PMID: 19550198; MCID:PMC2884382 |

3. **Mesothelioma Translational Research via Biobanking and Clinical Data Sharing:** Dr. Becich leads the National Mesothelioma Virtual Bank (<http://www.mesotissue.org>) since its inception in 2006. This CDC NIOSH funded effort provides research resources to the translational research community focused on this deadly cancer affecting asbestos-exposed patients and families. The discovery of the BAP1 gene mutation and its role in somatic mutations in mesothelioma is evidence of the impact of this important biospecimen and clinical data sharing network. NMVB currently involves four network partners and will receive funding through 2026:

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| a. | Cummings KJ, **Becich MJ**, Blackley DJ, Deapen D, Harrison R, Hassan R, Henley SJ, Hesdorffer M, Horton DK, Mazurek JM, Pass HI, Taioli E, Wu XC, Zauderer MG, Weissman DN. Workshop summary: Potential usefulness and feasibility of a US National Mesothelioma Registry. Am J Ind Med. 2020 Feb;63(2):105-114. doi: 10.1002/ajim.23062. Epub 2019 Nov 19. PMID: 31743489. |
| b. | Nasu M, Emi M, Pastorino S, Tanji M, Powers A, Luk H, Baumann F, Zhang YA, Gazdar A, Kanodia S, Tiirikainen M, Flores E, Gaudino G, **Becich MJ**, Pass HI, Yang H, Carbone M. High Incidence of Somatic BAP1 alterations in sporadic malignant mesothelioma. J Thorac Oncol. 2015 Apr;10(4):565-76. PMID: 25658628. PMCID: PMC4408084 |
| c. | Amin W, Singh H, Pople AK, Winters SB, Dhir R, Parwani AV, **Becich MJ**. A decade of experience in the development and implementation of tissue banking informatics tools for intra and inter-institutional translational research. Journal of Pathology Informatics. Journal of Pathology Informatics. 2010 Aug 10; 1 (12). PMCID: PMC2941965 |
| d. | Amin W, Parwani AV, Schmandt L, Mohanty SK, Farhat G, Pople AK, Winters SB, Whelan NB, Schneider AM, Milnes JT, Valdivieso FA, Feldman M, Pass HI, Dhir R, Melamed J, **Becich MJ**. National Mesothelioma Virtual Bank: a standard based biospecimen and clinical data resource to enhance translational research. BMC Cancer. 2008 Aug 13;8:236. PMID: 18700971. PMCID: PMC2533341 |

4. **Data Sharing:** Dr. Becich has been focused on providing tools for data sharing through informatics innovations. These innovations focus on implementing in open source tools both the policy and the technology to make data FAIR (findable, accessible, interoperable and reusable). The use of ontologies, patient matching algorithms, cohort identification, de-identification tools as well as the application of machine learning and causal models to “big data” are key to enabling data (and knowledge) sharing in a “commons” world:

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| a. | Linkov F, Silverstein JC, Davis M, Crocker B, Hao D, Schneider A, Schwenk M, Winters S, Zelnis J, Lee AV, **Becich MJ**. Integration of Cancer Registry Data into the Text Information Extraction System: Leveraging the Structured Data Import Tool. J Pathol Inform. 2018 Dec 24;9:47. doi: 10.4103/jpi.jpi\_38\_18. eCollection 2018. PMID: 30662793 |
| b. | Culbertson A, Goel S, Madden MB, Safaeinili N, Jackson KL, Carton T, Waitman R, Liu M, Krishnamurthy A, Hall L, Cappella N, Visweswaran S, **Becich MJ**, Applegate R, Bernstam E, Rothman R, Matheny M, Lipori G, Bian J, Hogan W, Bell D, Martin A, Grannis S, Klann J, Sutphen R, O'Hara AB, Kho A. The Building Blocks of Interoperability. A Multisite Analysis of Patient Demographic Attributes Available for Matching. Appl Clin Inform. 2017 Apr 5;8(2):322-336. PMID: 28378025 |
| c. | Tenenbaum JD, Whetzel PL, Anderson K, Borromeo CD, Dinov ID, Gabriel D, Kirschner B, Mirel B, Morris T, Noy N, Nyulas C, Rubenson D, Saxman PR, Singh H, Whelan N, Wright Z, Athey BD, **Becich MJ**, Ginsburg GS, Musen MA, Smith KA, Tarantal AF, Rubin DL, Lyster P. The Biomedical Resource Ontology (BRO) to enable resource discovery in clinical and translational research. J Biomed Inform. 2011 Feb;44(1):137-45. PMID: 20955817;PMCID:PMC3050430 |
| d. | Dhir R, Patel AA, Winters S, Bisceglia M, Swanson D, Aamodt R, **Becich MJ**. A multidisciplinary approach to honest broker services for tissue banks and clinical data: a pragmatic and practical model. Cancer. 2008 Oct 1;113(7):1705-15. PMID: 18683217. PMCID: PMC2745185. |

**D. Research Support**

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| |  |  | | --- | --- | | **Ongoing Research Support** | | | U24 OH009077-12  (Contact PI - Michael J. Becich) | 09/01/06 – 08/31/21 CDC NIOSH | | Sustaining the Expansion of the National Mesothelioma Virtual Bank (NMVB)  NMVB provides over 1700 patient biospecimen & data resource for mesothelioma investigators and has been funded for 15 years, soon to receive a renewal for an additional years five years. Partners include NYU Cancer Center, Roswell Park Cancer Institute, U Maryland Cancer Center and U Penn Abramson Cancer Center.  Role: Contact Principal Investigator | | |  | | | UL1TR001857-04 (PI Steve Reis) 07/12/06 – 05/31/21 NCATS  Clinical and Translational Science Institute of the University of Pittsburgh | | | Continuation of University of Pittsburgh Clinical and Translational Informatics Science Institute  The Clinical and Translational Science Institute (CTSI) at the University of Pittsburgh supports innovative research and is focused on creating the next generation of clinical researchers who transform research in community practices. Dr. Becich is Associate Director of CTSI and directs the Biomedical Informatics Component and co-leads the NCATS Accrual to Clinical Trials (ACT) network.  Role: Associate Director and Informatics Component Director | | |  | | | PCRF #1259  (MPIs - Becich, McTigue) | 11/01/14 – 09/30/20 PCRF | | A PaTH towards a Learning Health System  PaTH supports observational studies, pragmatic clinical trials and quality improvement studies. The PaTH Common Data Model (CDM) includes de-identified data from over 10 million patients with diverse geographic distribution, racial/ethnic backgrounds, and age distribution. Data on health system encounters, vital signs, diagnoses, laboratory results and medications have been standardized across PaTH and across PCORnet.  Role: PI/PD and Informatics Lead | | |
| Owkin, Inc. (Sole PI - Becich) 01/01/2020-07/31/2021 Industry SRA |
| Mesothelioma patient prognosis prediction from digital pathology WSIs using deep learning models.  The Owkin team requires an independent validation of a computational pathology deep learning algorithm utilized to classify mesothelioma patient outcomes and improve predictive power (Courtiol, et al. Nature Med. 2019). The Pitt NMVB team (see above) will provide 300 de-identified whole slide images (WSI) of pleural mesothelioma to validate the findings from the MESOBANK of France in a US cohort of patients. Dr. Becich will select the cases for inclusion in this validation study and Jonathan Silverstein will oversee with John Gilbertson the secure computational analysis of these cases with the Owkin team. The team will publish a full length manuscript to follow up the Nature Medicine paper based solely on the MESOnet French registry article.  Role: Contact Principal Investigator |