C. Rory Goodwin, MD, PhD May 8, 2020
Basic Science and Clinic Research Summary

Basic Science Research Summary: My lab investigates genetic predictors and cellular mechanisms of metastatic progression to the bone and spine, as well as the functional consequences of disease recurrence and progression. Currently, we are focused on the role of UDP-Glucose 6-dehydrogenase (UGDH) in the progression of hormone-dependent cancers (breast and prostate). UGDH produces UDP-glucuronic acid, a component of glycosaminoglycans (GAGs) and proteoglycans (PGs) of the extracellular matrix, which are implicated in a variety of human diseases, including the progression of tumors. In one of our previous studies, we identified UGDH as an important regulator of migration, cell proliferation and tumor formation. We are currently investigating the role of UGDH in brain and bone metastases.

In the coming year, we will develop animal models of spine metastases and epidural spinal cord compression, and investigate molecular alterations and genetic signatures associated with spine tumor phenotypes (i.e. bone only vs. epidural disease). Our goal is to identify novel molecular predictors and therapeutic targets that will aid in the optimization of treatment paradigms for spine tumor patients.

Major areas of focus:

A. Role of UGDH in hormone responsive tumors[1]
B. Animal models of spine tumors[2,3]
C. Genetic signatures associated with spine tumor phenotypes[4,5]

Clinical Research Summary: In parallel, we are investigating predictors of Health-Related Quality of Life (HRQOL) and clinical outcomes in patients diagnosed with spinal tumors. Primarily, we aim to identify patient-specific, treatment-specific, and/or system-specific factors (sociodemographic, neurologic status, radiographic spinopelvic parameters, peri-operative, genetic signatures, etc.) that are associated with HRQOL and clinical outcomes in spine tumor patients. We also evaluate the impact of resource/technology timing and utilization on patient-specific expectations and outcomes (i.e. palliative care, robot-assisted surgery, etc.). The goal of these studies is to identify optimal therapeutic interventions and prognostic factors for patients diagnosed with metastatic or primary spine tumors and to improve clinical outcomes. Currently I am PI for two clinical studies (MTRON, DSOS) enrolling patients, and I am sub-PI on two other studies focusing on spine tumors.

Major areas of focus:

A. Health-Related Quality of Life in Spine Tumors[6,7]
B. Post-surgical Outcomes[8,9]
C. Socioeconomic Disadvantage and Healthcare Disparity[10,11]
D. Peri-operative Optimization and Risk Stratification[12,13]
E. Palliative Care Utilization in Metastases affecting the CNS[14]
F. Patient-specific Expectations, Perceptions and Burden in Tumors affecting the CNS
G. Technology and Innovation[15]

1. Goodwin CR, Ahmed AK, Xia S. UDP-alpha-D-glucose 6-dehydrogenase: a promising target for glioblastoma. *Oncotarget.* 2019;10(16):1542-1543.
2. Sarabia-Estrada R, Ruiz-Valls A, Guerrero-Cazares H, et al. Metastatic human breast cancer to the spine produces mechanical hyperalgesia and gait deficits in rodents. *Spine J.* 2017;17(9):1325-1334.
3. Sarabia-Estrada R, Ruiz-Valls A, Shah SR, et al. Effects of primary and recurrent sacral chordoma on the motor and nociceptive function of hindlimbs in rats: an orthotopic spine model. *Journal of neurosurgery.* 2017;27(2):215-226.
4. Bettegowda C, Yip S, Jiang B, et al. Prognostic significance of hTERT (human telomerase reverse transcriptase) promoter region mutations C228T and C250T for overall survival in spinal chordomas. *Neuro-oncology.* 2019.
5. Goodwin CR, Abu-Bonsrah N, Rhines LD, et al. Molecular Markers and Targeted Therapeutics in Metastatic Tumors of the Spine: Changing the Treatment Paradigms. *Spine (Phila Pa 1976).* 2016;41 Suppl 20:S218-S223.
6. Barzilai O, Versteeg AL, Goodwin CR, et al. Association of neurologic deficits with surgical outcomes and health-related quality of life after treatment for metastatic epidural spinal cord compression. *Cancer.* 2019;125(23):4224-4231.
7. Sankey EW, Park C, Howell EP, et al. Importance of Spinal Alignment in Primary and Metastatic Spine Tumors. *World Neurosurg.* 2019;132:118-128.
8. Goodwin CR, Ahmed AK, Boone C, et al. The Challenges of Renal Cell Carcinoma Metastatic to the Spine: A Systematic Review of Survival and Treatment. *Global Spine J.* 2018;8(5):517-526.
9. Howell EP, Williamson T, Karikari I, et al. Total en bloc resection of primary and metastatic spine tumors. *Ann Transl Med.* 2019;7(10):226.
10. Elsamadicy AA, Kemeny H, Adogwa O, et al. Influence of racial disparities on patient-reported satisfaction and short- and long-term perception of health status after elective lumbar spine surgery. *Journal of neurosurgery.* 2018;29(1):40-45.
11. Abdelgadir J, Ong EW, Abdalla SM, et al. Demographic Factors Associated with Patient-Reported Outcome Measures in Pain Management. *Pain Physician.* 2020;23(1):17-24.
12. Pennington Z, Pielkenrood B, Ahmed AK, Goodwin CR, Verlaan JJ, Sciubba DM. Visceral Fat Volume From Standard Preoperative CT is an Independent Predictor of Short-term Survival in Patients Undergoing Surgery for Metastatic Spine Disease. *Clin Spine Surg.* 2019;32(6):E303-E310.
13. Ehresman J, Ahmed AK, Schilling A, et al. Preoperative Nutrition Consults Associated with Decreased Postoperative Complication Rate and Decreased Length of Hospital Stay After Spine Metastasis Surgery. *World Neurosurg.* 2020;133:e173-e179.
14. Williamson T, Painter B, Howell EP, Goodwin CR. Top Ten Tips Palliative Care Clinicians Should Know About Spinal Tumors. *J Palliat Med.* 2019;22(1):84-89.
15. Cho J, Rahimpour S, Cutler A, Goodwin CR, Lad SP, Codd P. Enhancing Reality: A Systematic Review of Augmented Reality in Neuronavigation and Education. *World Neurosurg.* 2020.