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Digital characterization of breast cancer phenotypes to identify variances in care and costs at scale

Background/Objectives:

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- The transition from "fee-for-service" to "value-based" payment reform requires stratification for important patient and disease related characteristics.
- The complexity of cancer, with multiple tumor and genomic characteristics influencing treatment decisions and outcomes, has made "big data" analytic techniques difficult to implement
- Current classifications of cancer using the ICD-10 system fail to fully describe clinical and prognostic elements among cancer patients
- COTA has developed a digital classification system that transforms prognostically significant attributes into digital code – precisely categorizing patient factors, their diseases, and intended therapy to enable the identification of variances in treatment patterns, quality benchmarking, research discovery and the transition to value-based medicine.
- This study applies the novel COTA Nodal Address (CNA) digital system to a consecutive cohort of patients with breast cancer to identify population frequencies of subtypes and variances in treatment patterns and total costs of care for one year following diagnosis.

Relevant Population:

- 1204 consecutive patients with breast cancer presenting for initial evaluation to oncologists of the Regional Cancer Care Associates between 2012-2015

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Proposed and Completed Actions:

- Oncologists with clinical expertise in breast cancer were polled to elucidate the evidence based prognostically significant attributes for the digital code. These included disease related factors (such as histology, tumor size, number of lymph nodes, sites of metastatic disease, hormone status, and genomic profile), patient factors (age, sex, ECOG performance, cardiac status, etc), and treatment factors (adjuvant/ neoadjuvant/ etc, 1st/2nd progression, etc)

- In breast cancer approximately 2975 distinct "phenotypes" of CNAs encompass the prognostic and treatment variable combinations

- By contrast, ICD10 characterizes breast cancer only by sex of patient and location of the tumor

- Using the digital classification consecutive patients are electronically assigned to CNA cohorts

Results/Impact:

- Only 114 CNAs (4%) were utilized in this cohort of patients, suggesting biologic disequilibrium (i.e.: certain combinations of elements are rare or do not occur)

- Two phenotypes accounted for the top 25% of cases, 6 for the top 50%, and 16 for the top 75%. Early stage, hormone positive, her2neu oncogene negative were most common in this community setting cohort consistent with good screening practices such as mammography. The CNA architecture facilitates rapid identification of population phenotypes, allowing faster evaluations of screening and diagnostic testing and better enumeration of sites of care (i.e.; whether complex cases are evaluated in community centers or referred to tertiary academic centers)

- Variances in treatment strategies varied by CNA type. The most common phenotype in this series was an early stage, hormone positive, her2neu negative, low oncotype dx genomic profile patient. There was general agreement in treatment strategy as 97% of these patients received hormonal therapy. By contrast patients with the same extended phenotype with the exception of an intermediate oncotype dx recurrence score had great variability of treatment strategies with 58% receiving hormonal therapy, 37% receiving non-

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anthracycline based chemotherapy and 5% receiving anthracycline based chemotherapy. Thus the CNA digital classification was able to rapidly identify phenotypes in which variance exist and thus point to areas for future research.

- Ongoing analysis is exploring the clinical and economic outcomes by CNA phenotype and treatment bundle.
- This study demonstrates that the digital CNA schema is able to segregate cancer patients into more homogenous cohorts with similar prognostic attributes, thus facilitating "big data" analytic approaches.

Partners:

Regional Cancer Care Associates

What support:

Generation of targeted clinical research to address areas of higher variances in outcomes and costs identified by the CNA digital classification schema

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