Clustering Results - Maddux

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## Methods

32 variables were used to partition the dataset into clusters. 31 variables were continuous measures of how many times a specific health care resource was used (i.e. hospitalization, epileptic medication, or tracheostomy). The measures were dividing by the number of months the patient was eligible in APCD or months alive, whichever came first (1-13). Death during the first year (y/n) was included in the clustering algorithm, but not divided by eligible months. Each variable was standardized (mean 0, sd 1) prior to inclusion in the clustering algorithms.

Three clustering algorithms were compared: k means, partition around medoids (PAM), and hierarchical clustering. The PAM algorithm with a gower distance matrix (can account for multiple variable types like we have here) was chosen for the final cluster assignments. Based on silhouette width, the best number of clusters was three.

Raw input variables (not standardized or divided by eligible months) were reported by cluster membership using median and interquartile range.

R version 3.6.0 was used for all analysis.

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| Characteristic | All (n=381) | Phenotype 1 (n=300) | Phenotype 2 (n=62) | Phenotype 3 (n=19) |
| **Medications** |  |  |  |  |
| At least one medication claim, n (%) | 304 (80%) | 227 (76%) | 62 (100%) | 15 (79%) |
| If at least one medication claim, how many, median (IQR) | 19.5 (6, 54) | 12 (4, 31) | 107 (58.5, 149.75) | 20 (7, 44.5) |
| How many medication claims (including zeros), median (IQR) | 11 (1, 41) | 6 (1, 22.25) | 107 (58.5, 149.75) | 8 (1, 40) |
| Anti-infectives, any, n (%) | 216 (57%) | 146 (49%) | 59 (95%) | 11 (58%) |
| Anti-infectives, claims, median (IQR) | 1 (0, 3) | 0 (0, 2) | 7 (2.25, 15) | 1 (0, 3.5) |
| Cardiac, any, n (%) | 31 (8%) | 20 (7%) | 10 (16%) | 1 (5%) |
| Cardiac, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Diuretics, any, n (%) | 14 (4%) | 7 (2%) | 7 (11%) | 0 (0%) |
| Diuretics, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Endocrine, any, n (%) | 26 (7%) | 13 (4%) | 11 (18%) | 2 (11%) |
| Endocrine, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Gastrointestinal, any, n (%) | 192 (50%) | 120 (40%) | 60 (97%) | 12 (63%) |
| Gastrointestinal, claims, median (IQR) | 1 (0, 8) | 0 (0, 2) | 27.5 (10.75, 48) | 2 (0, 4.5) |
| Hematologic, any, n (%) | 53 (14%) | 38 (13%) | 14 (23%) | 1 (5%) |
| Hematologic, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Inflammatory, any, n (%) | 53 (14%) | 31 (10%) | 17 (27%) | 5 (26%) |
| Inflammatory, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 1.75) | 0 (0, 0.5) |
| Neuro: antiepileptics, any, n (%) | 114 (30%) | 65 (22%) | 39 (63%) | 10 (53%) |
| Neuro: antiepileptics, claims, median (IQR) | 0 (0, 3) | 0 (0, 0) | 9 (0, 22.25) | 1 (0, 11) |
| Neuro: muscle relax, any, n (%) | 37 (10%) | 16 (5%) | 20 (32%) | 1 (5%) |
| Neuro: muscle relax, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 6.75) | 0 (0, 0) |
| Neuro: other, any, n (%) | 11 (3%) | 6 (2%) | 4 (6%) | 1 (5%) |
| Neuro: other, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Neuro: psych, any, n (%) | 110 (29%) | 65 (22%) | 38 (61%) | 7 (37%) |
| Neuro: psych, claims, median (IQR) | 0 (0, 2) | 0 (0, 0) | 5 (0, 15) | 0 (0, 1.5) |
| Neuro: stimulants, any, n (%) | 25 (7%) | 15 (5%) | 10 (16%) | 0 (0%) |
| Neuro: stimulants, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Pain, any, n (%) | 68 (18%) | 44 (15%) | 20 (32%) | 4 (21%) |
| Pain, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 1) | 0 (0, 0) |
| Pulmonary, any, n (%) | 153 (40%) | 100 (33%) | 46 (74%) | 7 (37%) |
| Pulmonary, claims, median (IQR) | 0 (0, 3) | 0 (0, 2) | 8 (0.25, 20.5) | 0 (0, 2.5) |
| Steroids, any, n (%) | 92 (24%) | 54 (18%) | 32 (52%) | 6 (32%) |
| Steroids, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 1 (0, 10) | 0 (0, 1) |
| Urologicals, any, n (%) | 12 (3%) | 10 (3%) | 2 (3%) | 0 (0%) |
| Urologicals, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| **Claim Type** |  |  |  |  |
| ED, any, n (%) | 202 (53%) | 130 (43%) | 60 (97%) | 12 (63%) |
| ED, claims, median (IQR) | 1 (0, 2) | 0 (0, 1.25) | 5 (2.25, 6) | 1 (0, 3) |
| Hospitalization, any, n (%) | 126 (33%) | 61 (20%) | 56 (90%) | 9 (47%) |
| Hospitalization, claims, median (IQR) | 0 (0, 1) | 0 (0, 0) | 2 (1, 4) | 0 (0, 2) |
| Primarycare, any, n (%) | 318 (83%) | 244 (81%) | 61 (98%) | 13 (68%) |
| Primarycare, claims, median (IQR) | 5 (2, 14) | 4 (1.75, 9) | 24.5 (15, 35.75) | 9 (0, 15.5) |
| Pulmonary, any, n (%) | 272 (71%) | 199 (66%) | 61 (98%) | 12 (63%) |
| Pulmonary, claims, median (IQR) | 2 (0, 6) | 1 (0, 4) | 13.5 (8, 18) | 3 (0, 12.5) |
| Rehabilitation, any, n (%) | 163 (43%) | 115 (38%) | 40 (65%) | 8 (42%) |
| Rehabilitation, claims, median (IQR) | 0 (0, 2) | 0 (0, 2) | 2 (0, 6.75) | 0 (0, 2.5) |
| Therapy, any, n (%) | 58 (15%) | 32 (11%) | 21 (34%) | 5 (26%) |
| Therapy, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 5.25) | 0 (0, 0.5) |
| **DMEs** |  |  |  |  |
| Dialysis, any, n (%) | 1 (0%) | 1 (0%) | 0 (0%) | 0 (0%) |
| Dialysis, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Feeding, any, n (%) | 148 (39%) | 79 (26%) | 58 (94%) | 11 (58%) |
| Feeding, claims, median (IQR) | 0 (0, 11) | 0 (0, 1.25) | 37.5 (18, 56) | 2 (0, 13.5) |
| Foley, any, n (%) | 18 (5%) | 9 (3%) | 7 (11%) | 2 (11%) |
| Foley, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Hearing/Communication, any, n (%) | 24 (6%) | 11 (4%) | 12 (19%) | 1 (5%) |
| Hearing/Communication, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Infusion, any, n (%) | 12 (3%) | 5 (2%) | 6 (10%) | 1 (5%) |
| Infusion, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) | 0 (0, 0) |
| Mobility, any, n (%) | 45 (12%) | 23 (8%) | 20 (32%) | 2 (11%) |
| Mobility, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 1) | 0 (0, 0) |
| Respiratory, any, n (%) | 155 (41%) | 91 (30%) | 51 (82%) | 13 (68%) |
| Respiratory, claims, median (IQR) | 0 (0, 5) | 0 (0, 1) | 24.5 (7, 50.75) | 5 (0, 18.5) |
| Therapy, any, n (%) | 107 (28%) | 66 (22%) | 34 (55%) | 7 (37%) |
| Therapy, claims, median (IQR) | 0 (0, 1) | 0 (0, 0) | 1 (0, 4) | 0 (0, 3) |
| Tracheostomy, any, n (%) | 35 (9%) | 12 (4%) | 21 (34%) | 2 (11%) |
| Tracheostomy, claims, median (IQR) | 0 (0, 0) | 0 (0, 0) | 0 (0, 2) | 0 (0, 0) |
| **Death in 1st Year** | 19 (5%) | 0 (0%) | 0 (0%) | 19 (100%) |
| **Morbidity Domains** |  |  |  |  |
| Neuro, n (%) | 185 (49%) | 121 (40%) | 52 (84%) | 12 (63%) |
| Feeding/Communication, n (%) | 217 (57%) | 141 (47%) | 62 (100%) | 14 (74%) |
| Respiratory, n (%) | 268 (70%) | 190 (63%) | 62 (100%) | 16 (84%) |
| Mobility, n (%) | 123 (32%) | 76 (25%) | 39 (63%) | 8 (42%) |