

Who Is at Risk for Influenza? Using Criteria Other Than Age

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ABSTRACT

Purpose

Colorado Access is a safety-net managed care organization that serves the medical and behavioral needs of the medically underserved. Because 75 percent of our population is children, we have had difficulty defining criteria to determine who is at risk for influenza and thus should receive an annual influenza vaccination. Our objective was to create a comprehensive list of diagnostic codes to be used to identify these high-risk individuals, using criteria other than age.

Methodology

A task force of medical experts familiar with diseases and chronic conditions associated with influenza and pneumonia convened to determine criteria other than age that can be used to identify populations recommended to receive an annual influenza vaccination. The task force used previously published criteria, compared them to the Advisory Committee on Immunization Practices (ACIP) recommendations, and developed a single, comprehensive diagnostic-criteria list that correlates with the ACIP recommendations, de-

finied by ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification, Fifth Edition) codes, to identify populations recommended to receive an annual influenza vaccination.

Principal findings

A comprehensive list of ICD-9 codes that indicate diagnostic criteria to be used to define populations at risk for influenza according to the ACIP recommendation was developed.

Conclusion

Colorado Access found that having criteria to target groups recommended to receive an annual influenza vaccine facilitates the planning of preventive health programs. These criteria may be beneficial to other health plans and agencies that promote flu vaccination.

INTRODUCTION

Colorado Access is a private, non-profit HMO committed to the care of the medically underserved in Colorado. We are the largest Medicaid managed care plan in the state. Colorado Access serves a very diverse population and, as a result, faces a number of obstacles that traditional HMOs rarely confront.

Because Colorado Access is a safety-net HMO, our population demographics are substantially different from traditional managed care plans. Our population is typically more chronically ill and younger than members of traditional and commercial health plans. A primary barrier that Colorado Access must repeatedly address is the lack of preventive care sought by our mem-

bers. Prenatal care, immunizations, regular visits with a primary care physician, and other preventive care measures have become an integral part of our health program development.

Influenza vaccinations are an important component of the preventive care provided by Colorado Access practitioners because many of our members are in groups at high risk for infection. Traditionally, other HMOs and mass media campaigns have targeted senior citizens for flu vaccination. However, less than 10 percent of our member population is over the age of 50. Using age as a primary parameter to study and promote influenza vaccination is not an appropriate option for us — we must focus on other high-risk target groups as recommended by the Advisory Committee on Immunization Practices.

The ACIP strongly recommends an annual influenza vaccination for persons who are at high risk for influenza-related complications.¹ Among these high-risk target groups are:

- adults and children who have chronic disorders of the pulmonary or cardiovascular systems, including children with asthma; and
- adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression (including immunosuppression caused by medications).

Identifying which members have

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This paper has been peer reviewed
by appropriate members of MANAGED
CARE'S Editorial Advisory Board.

chronic disorders of the pulmonary or cardiovascular systems or have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases has been difficult. Recently, there have been several published studies that have included descriptive criteria for identifying populations at high risk for influenza; however, the criteria used to define the populations varied, even though the ACIP recommendations remained virtually unchanged.²⁻⁹ To address this inconsistency, a focused task force of medical experts was assembled. This task force reviewed the ACIP recommendations and previous publications, and determined which ICD-9-CM codes (International Classification of Diseases, Ninth Revision, Clinical Modification, Fifth Edition) would appropriately fit into the ACIP influenza recommendation categories. ICD-9-CM is an index of diagnostic descriptors, procedures, and diseases.¹⁰

METHODS

An expert focus group methodology was used. The experts on the panel were chosen because they are recognized as being experienced with influenza vaccinations and epidemics, having medical expertise relevant to the chronic conditions and diseases associated with influenza and pneumonia, and are familiar with the risk factors associated with increased complications resulting from influenza. Representation included board-certified practicing physicians. One participant is an international expert in influenza; another formerly worked for the National Immunization Program at the Centers for Disease Control and, at the time the panel convened, was director of the Health Care Quality Improvement Program for Medicare in Colorado. The objectives of the expert panel were:

- review diagnostic criteria used in methodologies of previously pub-

lished literature,²⁻⁹ with the goal of identifying comprehensive diagnostic criteria that correspond with the ACIP recommendations, and

- develop a single, comprehensive list of diagnostic criteria that correspond with the ACIP recommendations.

The final draft was reviewed and accepted by clinical leaders who included medical directors and practitioners representing the Children's Hospital, University of Colorado Hospital and University Physicians, Denver Health and Hospitals, and the Colorado Community Managed Care Network (representing federally qualified health centers in Colorado). The criteria logic was used to extract health plan member information from our administrative data system. These members were stratified by assigned primary care provider, and patient profile lists were distributed to the appropriate primary care provider for use in their influenza promotion activities.

RESULTS

Table 1 reflects the conclusions of the expert focus group. The collection of criteria defined in previous literature was used to make a single, comprehensive list. Other ICD-9 categories not used in previous literature were found to be appropriate for inclusion in these criteria, based on the medical expertise of the panel. Among these additions were "Hereditary and degenerative diseases of the central nervous system" and "Other disorders of the central nervous system." The table is a single, comprehensive list of diagnostic criteria to identify individuals who are younger than age 50 and at risk of developing complications from influenza, as recommended by ACIP. The table details ICD-9-CM categories and codes.

CONCLUSION

Colorado Access found this compilation of ICD-9-CM codes to be a

very useful tool in assisting us to manage influenza. Colorado Access now has appropriate criteria to identify the population at risk for complications due to influenza, and, therefore, recommended to obtain an annual influenza vaccination. We have used this tool to educate our practitioners and to help them identify who is at highest risk for influenza. Additionally, as part of our flu program, we found that sending practitioners the high-risk criteria along with lists of members we identify as being at risk for flu-related complications has resulted in an increased flu vaccination rate.

Criteria presented in this article were derived from a panel of physicians representing board-certified practitioners, the Colorado Department of Public Health and Environment, and the University of Colorado School of Medicine. Except for the state health department representative, all panel members have practiced medicine. While our experts are representing practices in Colorado, they have practiced in other regions of the United States. Therefore, we feel that the tool can be applied to populations in any geographic areas.

Many health plans have influenza programs that target individual populations at risk for influenza due to age. Additionally, there has been recent national attention, originating from the Centers of Disease Control, on promoting annual influenza vaccinations among diabetics. However, because the ACIP recommendations are in general terms, many organizations overlook several at-risk groups. The criteria provided in this article may be beneficial to other health plans and health agencies that promote flu vaccination, especially health plans that serve the younger Medicaid and Children's Basic Health Plan (CHIP) populations.

Most health plans collect administrative data from their practitioners, whether claims from a fee-for-service provider or encounter data from a

Table 1. Definition of At-Risk Target Population for Influenza Interventions

Adults and children who have chronic disorders of the pulmonary or cardiovascular systems, including children with asthma.

CHRONIC DISORDERS OF PULMONARY SYSTEM, INCLUDING ASTHMA

Tuberculosis

- 010: Primary tuberculous infection (010.0 – 010.9)
- 011: Pulmonary tuberculosis (011.0 – 011.9)
- 012: Other respiratory tuberculosis (012.0 – 012.8)
- 018: Military tuberculosis (018.0 – 018.9)
- 135: Sarcoidosis

Pneumonia and influenza (480-487)

- 480: Viral pneumonia (480.0 – 480.9)
- 481: Pneumococcal pneumonia
- 482: Other bacterial pneumonia (482.0 – 482.9)
- 483: Pneumonia due to other specified organism (483.0 – 483.8)
- 484: Pneumonia in infectious diseases classified elsewhere (484.1 – 484.8)
- 485: Bronchopneumonia, organism unspecified
- 486: Pneumonia, organism unspecified
- 487: Influenza (487.0 – 487.8)

Chronic obstructive pulmonary disease and allied conditions

- 491: Chronic bronchitis (491.0 – 491.9)
- 492: Emphysema (492.0 – 492.8)
- 493: Asthma (493.0 – 493.9)
- 494: Bronchiectasis
- 495: Extrinsic allergic alveolitis (495.0 – 495.9)
- 496: Chronic airways obstruction, not elsewhere classified

Pneumoconioses and other lung diseases due to external agents (500-508)

- 500: Coal workers' pneumoconiosis
- 501: Asbestosis
- 502: Pneumoconiosis due to other silica or silicates
- 503: Pneumoconiosis due to other inorganic dust
- 504: Pneumopathy due to inhalation of other dust
- 505: Pneumoconiosis, unspecified
- 506: Respiratory conditions due to chemical fumes and vapors (506.0 – 506.9)
- 507: Pneumonitis due to solids and liquids (507.0 – 507.8)
- 508: Respiratory conditions due to other and unspecified external agents (508.0 – 508.9)

Other diseases of respiratory system

- 510: Empyema (510.0 – 510.9)
- 511: Pleurisy (511.0 – 511.9)
- 512: Pneumothorax (512.0 – 512.8)
- 513: Abscess of lung and mediastinum (513.0 – 513.1)
- 514: Pulmonary congestion and hypostasis
- 515: Postinflammatory pulmonary fibrosis
- 516: Other alveolar and parietoalveolar pneumopathy (516.0 – 516.9)

517: Lung involvement in conditions classified elsewhere (517.1 – 517.8)

518: Other diseases of lung (518.0 – 518.89)

CHRONIC DISORDERS OF THE CARDIOVASCULAR SYSTEM

Acute rheumatic fever (390-392)

- 390: Rheumatic fever without mention of heart involvement
- 391: Rheumatic fever with heart involvement (391.0 – 391.9)
- 392: Rheumatic chorea (392.0 – 392.9)

Chronic rheumatic heart disease (393-398)

- 393: Chronic rheumatic pericarditis
- 394: Diseases of mitral valve (394.0 – 394.9)
- 395: Diseases of aortic valve (395.0 – 395.9)
- 396: Diseases of mitral and aortic valves (396.0 – 396.9)
- 397: Diseases of other endocardial structures (397.0 – 397.9)
- 398: Other rheumatic heart disease (398.0 – 398.99)

Hypertensive disease

- 402: Hypertensive heart disease (402.0 – 402.91)
- 403: Hypertensive renal disease (403.0 – 403.9)
- 404: Hypertensive heart and renal disease (404.0 – 404.9)

Ischemic heart disease (410-414)

- 410: Acute myocardial infarction (410.0 – 410.9)
- 411: Other acute and subacute form of ischemic heart disease (411.0 – 411.89)
- 412: Old myocardial infarction
- 413: Angina pectoris (413.0 – 413.9)
- 414: Other forms of chronic ischemic heart disease (414.0 – 414.19)

Disease of pulmonary circulation (415-417)

- 415: Acute pulmonary heart disease (415.0 – 415.19)
- 416: Chronic pulmonary heart disease (416.0 – 416.9)
- 417: Other diseases of pulmonary circulation (417.0 – 417.9)

Other forms of heart disease

- 420: Acute pericarditis (420.0 – 420.99)
- 421: Acute and subacute endocarditis (421.0 – 421.9)
- 422: Acute myocarditis (422.0 – 422.99)
- 423: Other diseases of pericardium (423.0 – 423.9)
- 424: Other diseases of endocardium (424.0 – 424.99)
- 425: Cardiomyopathy (425.0 – 425.9)
- 428: Heart failure (428.0 – 428.9)
- 429: Ill-defined descriptions and complications of heart disease (429.0 – 429.9)

Cerebrovascular disease

- 430: Subarachnoid hemorrhage
- 431: Intracerebral hemorrhage
- 432: Other and unspecified intracranial hemorrhage (432.0 – 432.9)
- 433: Occlusion and stenosis of precerebral arteries (433.0 – 433.9)
- 434: Occlusion of cerebral arteries (434.0 – 434.9)

- 436: Acute but ill-defined cerebrovascular disease
- 437: Other and ill-defined cerebrovascular disease (437.0 – 437.9)
- 438: Late effects of cerebrovascular disease (438.0 – 438.9)

Disease of arteries, arterioles, and capillaries

- 440: Atherosclerosis (440.0 – 440.9)
- 441: Aortic aneurysm and dissection (441.0-441.9)
- 444: Arterial embolism and thrombosis (444.0 – 444.9)
- 446: Polyarteritis nodosa and allied conditions (446.0 – 446.7)
- 447: Other disorders of arteries and arterioles (447.0 – 447.9)

Adults and children who have required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression (including immunosuppression caused by medications)

CHRONIC METABOLIC DISEASE INCLUDING DIABETES

Diseases of other endocrine glands

- 250: Diabetes mellitus (250.0 - 250.9)
- 251: Other disorders of pancreatic internal secretion (251.0 - 251.9)

Nutritional deficiencies

- 260: Kwashiorkor
- 261: Nutritional marasmus
- 262: Other severe protein-calorie malnutrition
- 263: Other and unspecified protein-calorie malnutrition (263.0 – 263.9)

Other metabolic disorders and immunity disorders

- 270: Disorders of amino-acid transport and metabolism (270.0 – 270.9)
- 271: Disorders of carbohydrate transport and metabolism (271.0 – 271.9)
- 272: Disorders of lipid metabolism (272.0 – 272.9)
- 273: Disorders of plasma protein metabolism (273.0 – 273.9)
- 275: Disorders of mineral metabolism (275.0 – 275.9)
- 277: Other and unspecified disorders of metabolism (277.0 – 277.9)
- 279: Disorders involving the immune mechanism (279.0 – 279.9)

RENAL DYSFUNCTION

Nephritis, nephrotic syndrome, and nephrosis

- 580: Acute glomerulonephritis (580.0 – 580.9)
- 581: Nephrotic syndrome (581.0 – 581.9)
- 582: Chronic glomerulonephritis (582.0 – 582.9)
- 583: Nephritis and nephropathy, not specified as acute or chronic (583.0 – 583.9)
- 584: Acute renal failure (584.5 – 584.9)
- 585: Chronic renal failure

- 586: Renal failure, unspecified
- 587: Renal sclerosis, unspecified
- 588: Disorders resulting from impaired renal function (588.0 – 588.9)

HEMOGLOBINOPATHIES

Diseases of blood and blood-forming organs

- 282: Hereditary hemolytic anemias (282.0 – 282.9)
- 283: Acquired hemolytic anemias (283.0 – 283.9)
- 284: Aplastic anemia (284.0 – 284.9)
- 287: Purpura and other hemorrhagic conditions (287.0 – 287.9)
- 288: Diseases of white blood cells (288.0 – 288.9)
- 289: Other diseases of blood and blood-forming organs (289.0 – 289.9)

IMMUNOSUPPRESSION (INCLUDING THAT CAUSED BY MEDICATIONS)

Human immunodeficiency virus (042)

- 042: Human immunodeficiency virus (HIV) disease

Malignant neoplasm of lip, oral cavity, and pharynx (140-149)

- 140: Malignant neoplasm of lip (140.0 – 140.9)
- 141: Malignant neoplasm of tongue (141.0 – 141.9)
- 142: Malignant neoplasm of major salivary glands (142.0 – 142.9)
- 143: Malignant neoplasm of gum (143.0 – 143.9)
- 144: Malignant neoplasm of floor of mouth (144.0 – 144.9)
- 145: Malignant neoplasm of other and unspecified parts of mouth (145.0 – 145.9)
- 146: Malignant neoplasm of oropharynx (146.0 – 146.9)
- 147: Malignant neoplasm of nasopharynx (147.0 – 147.9)
- 148: Malignant neoplasm of hypopharynx (148.0 – 148.9)
- 149: Malignant neoplasm of other and ill-defined sites within the lip, oral cavity, and pharynx. (149.0 – 149.9)

Malignant neoplasm of digestive organs and peritoneum (150-159)

- 150: Malignant neoplasm of esophagus (150.0 – 150.9)
- 151: Malignant neoplasm of stomach (151.0 – 151.9)
- 152: Malignant neoplasm of small intestine, including duodenum (152.0 – 152.9)
- 153: Malignant neoplasm of colon (153.0 – 153.9)
- 154: Malignant neoplasm of rectum, rectosigmoid junction, and anus. (154.0 – 154.8)
- 155: Malignant neoplasm of liver and intrahepatic bile ducts (155.0 – 155.2)
- 156: Malignant neoplasm of gallbladder and extrahepatic bile ducts (156.0 – 156.9)
- 157: Malignant neoplasm of pancreas (157.0 – 157.9)
- 158: Malignant neoplasm of retroperitoneum and peritoneum (158.0 – 158.9)
- 159: Malignant neoplasm of other and ill-defined sites within the digestive organs and peritoneum (159.0 – 159.9)

Malignant neoplasm or respiratory and intrathoracic organs (160-165)

- 160: Malignant neoplasm of nasal cavities, middle ear, and accessory sinuses (160.0 – 160.9)
- 161: Malignant neoplasm of larynx (161.0 – 161.9)
- 162: Malignant neoplasm of trachea, bronchus, and lung (162.0 – 162.9)
- 163: Malignant neoplasm of pleura (163.0 – 163.9)
- 164: Malignant neoplasm of thymus, heart, and mediastinum (164.0 – 164.9)
- 165: Malignant neoplasm of other and ill-defined sites within the respiratory system and intrathoracic organs (165.0 – 165.9)

Malignant neoplasm of bone, connective tissue, skin, and breast (170-176)

- 170: Malignant neoplasm of bone and articular cartilage (170.0 – 170.9)
- 171: Malignant neoplasm of connective and other soft tissue (171.0 – 171.9)
- 172: Malignant melanoma of skin (172.0 – 172.9)
- 173: Other malignant neoplasm of skin (173.0 – 173.9)
- 174: Malignant neoplasm of female breast (174.0 – 174.9)
- 175: Malignant neoplasm of male breast (175.0 – 175.9)

Kaposi's sarcoma (176)

- 176: Kaposi's sarcoma (176.0 – 176.9)

Malignant neoplasm of genitourinary organs (179-189)

- 179: Malignant neoplasm of uterus, part unspecified
- 180: Malignant neoplasm of cervix uteri (180.0 – 180.9)
- 181: Malignant neoplasm of placenta
- 182: Malignant neoplasm of body of uterus (182.0 – 182.8)
- 183: Malignant neoplasm of ovary and other uterine adnexa (183.0 – 183.9)
- 184: Malignant neoplasm of other and unspecified female genital organs (184.0 – 184.9)
- 185: Malignant neoplasm of prostate
- 186: Malignant neoplasm of testis (186.0 – 186.9)
- 187: Malignant neoplasm of penis and other male genital organs (187.1 – 187.9)
- 188: Malignant neoplasm of bladder (188.0 – 188.9)
- 189: Malignant neoplasm of kidney and other unspecified urinary organs (189.0 – 189.9)

Malignant neoplasm of other and unspecified sites (190-199)

- 190: Malignant neoplasm of eye (190.0 – 190.9)
- 191: Malignant neoplasm of brain (191.0 – 191.9)
- 192: Malignant neoplasm of other and unspecified parts of nervous system (192.0 – 192.9)
- 193: Malignant neoplasm of thyroid gland
- 194: Malignant neoplasm of other endocrine glands and related structures (194.0 – 194.9)
- 195: Malignant neoplasm of other and ill-defined sites (195.0 – 195.8)

- 196: Secondary and unspecified malignant neoplasm of lymph nodes (196.0 – 196.9)
- 197: Secondary malignant neoplasm of respiratory and digestive systems (197.0 – 197.8)
- 198: Secondary malignant neoplasm of other specified sites (198.0 – 198.89)
- 199: Malignant neoplasm without specification of site (199.0 – 199.1)

Malignant neoplasm of lymphatic and hematopoietic tissue (200-208)

- 200: Lymphosarcoma and reticulosarcoma (200.0 – 200.8)
- 201: Hodgkin's disease (201.0 – 201.9)
- 202: Other malignant neoplasm of lymphoid and histiocytic tissue (202.0 – 202.9)
- 203: Multiple myeloma and immunoproliferative neoplasms (203.0 – 203.8)
- 204: Lymphoid leukemia (204.0 – 204.9)
- 205: Myeloid leukemia (205.0 – 205.9)
- 206: Monocytic leukemia (206.0 – 206.9)
- 207: Other specified leukemia (207.0 – 207.8)
- 208: Leukemia of unspecified cell type (208.0 – 208.9)

Hereditary and degenerative diseases of the central nervous system (330-337)

- 330: Cerebral degenerations usually manifest in childhood (330.0 – 330.9)
- 331: Other cerebral degenerations (331.0 – 331.9)
- 332: Parkinson's disease (332.0 – 332.1)
- 333: Other extrapyramidal diseases and abnormal movement disorders (333.0 – 333.99)
- 334: Spinocerebellar disease (334.0 – 334.9)
- 335: Anterior horn cell disease (335.0 – 335.9)
- 336: Other diseases of spinal cord (336.0 – 336.9)
- 337: Disorders of the autonomic nervous system (337.0 – 337.9)

Other disorders of the central nervous system

- 340: Multiple sclerosis
- 341: Other demyelinating disease of central nervous system (341.0 – 340.9)
- 342: Hemiplegia and hemiparesis (342.0 – 342.9)
- 343: Infantile cerebral palsy (343.0 – 343.9)
- 344: Other paralytic syndromes (344.0 – 344.9)
- 290: Senile dementia, uncomplicated (290.0 – 290.9)

Children and teenagers (aged 6 months to 18 years) who are receiving long-term aspirin therapy and therefore might be at risk for developing Reye's syndrome after influenza.

- 714: Rheumatoid arthritis and other inflammatory polyarthropathies (714.0 – 714.9)
- 446: Polyarteritis nodosa and allied conditions (already included in above category) (446.0 – 446.7)

capitated provider, and have constructed administrative data systems. The criteria provided in this article can be used as logic for querying administrative data systems to identify the at-risk-for-influenza population of the health plan. However, there are cautions that need to be acknowledged if health plans use administrative data systems based on encounter reports to identify members by diagnostic groups. In a capitated environment, encounter data may not be as thorough or complete as in a fee-for-service situation because there is not the same financial incentive to report on every service provided and diagnosis given for every patient. Despite this limitation of administrative data systems built from encounter data, health plans have an opportunity to collaborate with practitioners by identifying members who should receive an annual influenza vaccination.

Of particular importance to practitioners, there has been a trend during the last couple of years that has influenced the administration of influenza vaccine. For the 2000-01 influenza season in the United States, lower-than-anticipated yields for this year's influenza vaccine component and other manufacturing problems are expected to lead to a substantial delay in the distribution of influenza vaccine. This may result in substantially fewer total doses of vaccine distribution for this year. The CDC and ACIP have issued adjunct recommendations¹¹ specific to the 2000-01

flu season, stating, "Routine influenza vaccination activities ... especially vaccination of persons at high risk for complications from influenza ... should proceed as normal with available vaccine practitioners." The list detailed in this article will aid practitioners in determining which patients are at higher risk and should receive a flu shot without delay.

Acknowledgments

The following people participated on the expert panel to produce the criteria. They provided medical expertise and clinical consultation, and reviewed the ICD-9 codes to determine the appropriate diagnostic criteria to identify those at risk for influenza: William J. Alexander, M.D., former medical director at Colorado Access; Tim Englert, formerly of the Colorado Department of Public Health and Environment in the disease control and epidemiology section; Steven R. Mostow, M.D., University of Colorado Health Sciences Center; W. William Schluter, M.D., M.S.P.H., Colorado Foundation for Medical Care; and Barbara Warren, M.D., Denver Health Medical Center.

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