**APPENDIX 1**

Estimating Intervention Cost for Clinical Decision Support Systems to Prevent Cardiovascular Disease

The cost of a clinical decision support system (CDSS) is the monetized value of labor and non-labor resources needed to develop and implement the system (capital cost), and once in place, the cost to operate and maintain it (operating cost).(1) The components of cost to develop the CDSS include the cost of compiling evidence-based narrative guidelines and programming the guidelines and decisions into code to produce prompts for provider action, all in consultation with providers. The system is then implemented throughout the practice and for all providers. The cost of ideal implementation can include re-organization of care and responsibilities, where necessary, and the education and training of providers regarding the rationale and use of the system. The day-to-day use and maintenance of the CDSS require staff time and other resources, and are categorized under operating cost. With new and improving information technologies, medical knowledge, and treatments, it is expected that a CDSS will require upgrades roughly every 5 years. The 5-year time frame for updating the knowledge base, software, and hardware is based on both tax rules(2) and the frequency of issuance of new guidelines for treatment of hypertension(3) and high cholesterol.(4) These costs are categorized as replacement cost for the hardware, software upgrade, and any continuing education for staff. Cost of upgrade and replacement is accounted for by amortizing the one-time cost of development and implementation over the assumed 5-year useful life of the CDSS. (Amortization is an accounting procedure where the one-time cost of acquisition of a product is distributed over the number of years of its useful life.)

Sound accounting, governed by accepted standards of practice(1, 5) and IRS tax rules(2), requires amortizing the cost of a CDSS implementation either over a 5-year period beginning from date of completion of the build or 3 years from date of placement in use. The end-life of a CDSS occurs when it is necessary to thoroughly revise the content or implement on a new platform; this depends on multiple factors including the scientific validity of the knowledge base from which decision rules are constructed, innovations in treatment and prevention, Internal Revenue Service (IRS) amortization rules, and changes in information technology. Revised guidelines from the Joint National Committee (JNC) for treatment of hypertension have appeared on a 4-5 year cycle (beginning in 1977)(3) whereas the Adult Treatment Panel (ATP) guidelines for treatment of high cholesterol occurred 5, 8, and 3 years apart (beginning in 1988),(4) and the IRS code requires not less than a 3-year period of amortization for computer software. Further, IRS rules require that the cost of development and implementation of a CDSS be capitalized,(2) while the cost of training staff must be expensed and not capitalized, as should be the annual information technology (IT) and medical staff support for operating the CDSS.(6) Based on these considerations and requirements, the present review considers a straight-line amortization(7) over a 5-year useful life and zero residual value to be an ideal set of accounting rules for CDSS implementations. The equation below summarizes the discussion about intervention cost of a CDSS implementation.

Following IRS rules:

Year 1 intervention cost = $X/n + $Z1 + $Z2 + $Y

Year 2 through Year 5 intervention cost = $X/n + $Z2 + $Y

Following internal costing objectives:

Annual intervention cost = $X/n + $Z1/n + $Z2 + $Y

Where,

X - Cost of development and implementation

Z1 - Cost of initial staff training

Z2 - Annual ongoing staff training

Y - Annual operating cost

n – Years of useful life

**Appendix References**

1 American Institute of Certified Public Accountants. Statement of Position 98-1. Accounting for the costs of computer software developed or obtained for internal use. New York: American Institute of Certified Public Accountants, Inc.; 1998. p. 21.

2 Internal Revenue Service. 26 U.S. Code § 174b - Research and experimental expenditures. 2006.

3 Kotchen TA. Developing hypertension guidelines: an evolving process. Am J Hypertens. 2014;**27**(6):765-72.

4 Talwalkar PG, Sreenivas CG, Gulati A, Baxi H. Journey in guidelines for lipid management: from adult treatment panel (ATP)-I to ATP-III and what to expect in ATP-IV. Indian J Endocinal Metab. 2013;**17**(4):628.

5 Financial Accounting Standards Board. Accounting for the costs of computer software to be sold, leased, or otherwise marketed. Statement of Financial Accounting Standards No 86. Norwalk, CT: Financial Accounting Standards Board; 1985.

6 Internal Revenue Service. 26 U.S. Code §162 - Trade or business expenses. 2006.

7 Internal Revenue Service. 26 U.S. Code §167(f)(1) - Depreciation. 2006.