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A comparison of different measures of medical technology intensity.

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Abstract

Objective: To explore the meaning and usefulness of three measures of medical technology intensity: number of units of technology (e.g., machines, devices) per million population (pmp), per thousand physicians (ptp), and per billion dollars of health expenditures (phe). We suggest these three measures on the assumption that the number of units pmp roughly expresses the availability of a technology to the population, while units ptp expresses the labor-vs.-technology intensity of a given health care system, and units phe reflects the degree to which a country's health care expenditures are invested in technology. In this paper, we illustrate the three measures with the case of radiation therapy units (RTUs) in OECD countries.

Methods: Using a subset of data collected for a larger project on the diffusion of "big ticket" medical technology in different countries, we calculated the number of RTUs (linear accelerators and cobalt units) in OECD countries in 1990 pmp, ptp, and phe. Technology data were collected from the multinational manufacturing industry, national and international institutions, and the literature, and were subject to reliability and validity analyses. Population, physician, and 1990 health care expenditures data were collected from World Bank and OECD publications.

Results: Wide variations were observed for each measure between countries, and for several measures within the same country. For example, the U.S. leads all other OECD countries in RTUs pmp and ptp, but ranks 14th in RTUs phe. In general, there is considerable variation among countries in RTUs pmp (mean = 4.59; Coefficient of Variation [CV] for all 24 OECD countries = 0.43), and in terms of units ptp (mean = 1.99; CV = 0.47), whereas they are more homogenous in units phe (mean = 4.13; CV = 0.28). Taking Japan, the U.S., Spain and Sweden as a simplified example (see graph), it can be seen that countries tend to be ranked differently depending on the measure chosen. In fact, among the four countries in the graph, the U.S. ranks first in RTUs pmp and ptp, but is last among in RTUs phe. In comparison to Sweden, Spain has one-half as many RTUs pmp and one-third as many RTUs ptp, but both countries have the same amount relative to their respective health care expenditures. Comparisons of other countries and technologies will be presented.

Conclusions: Depending on the type of measure chosen, a country's health care system could be considered more or less technology intensive. OECD countries tend to be more homogenous in terms of the investment of their health care systems in technology than in the distribution of the technology by population or physicians. No single index is "best," but one may be more appropriate than another depending on the context and purpose, since they measure different kinds of intensity.

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