AMALGAM AND ALTERNATIVES

Alternatives to amalgam fall short and cost more

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BACKGROUND

The treaty of Minamata has dictated the phase-down of dental amalgam and the promotion of cost-effective and clinically effective mercury-free alternatives for dental restorations. Among the alternatives are resin composites, which includes incrementally placed composites (IComp) and composite inlays (CompI); bulk-fill composites (BComp), which can be bulk placed or incrementally placed (IBComp); and glass ionomer cements (GIC). To evaluate the cost-effectiveness of amalgam alternatives for restoring permanent posterior teeth and the value of having better information on the effectiveness of the various alternatives, a model was developed to test various scenarios and to perform value of information (VOI) analyses to quantify the monetary benefit of future research and justify or refute the need for more studies.

METHODS

The model was based on data derived from 18 studies that included 3162 participants with 6696 restorations that were followed-up for a mean of 3.8 years. The context of Germany and its mixed public-private-payer perspective were assumed. Effectiveness estimates (relative risk [RR] of failure) were based on Bayesian network meta-analyses. The target population was publicly insured Germans who were receiving restorations in the posterior permanent dentition that were delivered in amalgam as a standard material. Ease of modeling dictated the choice of initially 30-year-old male individuals who were receiving 3-surface mesial-occlusal-distal restorations on a permanent molar. Remaining lifetime was 49 years. The alternatives that were investigated were BComp, GIC, and IComp. In addition, CompI and IBComp were included in the sensitivity analyses. Cost-effectiveness evaluations were performed per 1 molar, with costs derived from insurance fee items and expressed in euros. The cost-effectiveness, cost-effectiveness acceptability, and VOI estimates were done using Monte Carlo microsimulations.

RESULTS

In the base-case analysis, BComp and GIC were less costly than IComp but also associated with more failures. BComp was initially as costly as IComp, but had more failures. CompI was initially costlier than IComp and less effective. Amalgam was less prone to risk of failure than any of the amalgam alternatives.

When patients were followed throughout their lifetime, IComp was the most effective option as well as the least costly. When the uncertainty was eliminated from the relative effectiveness of the various strategies, payers would realize a savings of €3.99 per restoration. GIC and BComp were either less costly than IComp or more effective or both. The annual economic savings were estimated to be €87.8 million for the payers.

Sensitivity analyses showed that CompI and IBComp were both more costly and less effective as amalgam alternatives than IComp. Assuming the patient was older, with a shorter simulation period, did not alter the ranking but overall costs decreased. If 80% of the teeth were to be replaced, the costs for all strategies were drastically increased. When data from cohort studies were considered, IComp was more effective and less costly than the alternatives, but BComp was superior to GIC in terms of effectiveness and cost. BComp and GIC would be cost-effective if they had a maximal RR of failure compared to IComp of $\leq$ 1.08.

DISCUSSION

Amalgam is still the standard for restoring extended cavitated lesions in posterior teeth of the permanent dentition in many areas of the world, offering ease of application and proven longevity. Because it is being slowly phased out, a standard alternative is needed. Currently the data on the effectiveness of amalgam alternatives remain limited, yet the data show that none of them are superior to amalgam.

Clinical Significance

Most of the amalgam alternatives tested were more costly and less effective or had limited lifespans compared to amalgam. Clinical decisions regarding a replacement for amalgam must consider factors beyond cost-effectiveness so that meaningful recommendations can be formulated.

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