OBJECTIVES: For assessing the long-term health economic impact of obesity programs, modelling techniques are frequently applied to project—associated clinical events over time. To obtain information on the predictive quality of the applied event simulations, which ensures the acceptance of results from economic evaluations, published external validation approaches were identified, reviewed and analyzed.

METHODS: A systematic review was performed in PubMed and NHSEED to identify decision models for full health economic assessments (HEA) in obesity. For each included study we extracted information on the external event validation approach, using the best practice recommendations of the report on “Model Transparency and Validation” issued by the ISPOR-SMDM Modeling Good Research Practices Task Force.

RESULTS: We identified 87 papers and 72 (82%) simulated obesity-associated events. Only ten models (<15%) performed an external validation and only for one the predictiveness of the event simulation was investigated (a cohort of obesity-related events (HEAD study); mean BMI 35.9 kg/m²). Considering other ISPOR best practice criteria we have found that for none of these external validation cases a systematic identification of suitable data sources was performed, and that a justification of the data source selection, due to predefined criteria, was identified only in three cases. However an adequate result presentation (simulation results provided for each source) and a justification of the data source selection (due to predefined criteria) was provided for most external validation cases (82 cases).

CONCLUSIONS: We found that only a limited number of published decision models for full HEAs in obesity have applied an external event validation. In addition, those who conducted such validations suffered from major limitations including the data source selection process, as only in one case, obesity cohorts were used as basis for the event simulation procedure. Thus in conclusion published obesity models lack information on the predictive quality of the applied event simulation approaches.

Abstract

Introduction

Obesity is a multicausal, chronic disorder that has, according to the World Health Organization (WHO), reached epidemic proportions globally and is a major contributor to the global burden of chronic disease and disability [1].

The body mass index (BMI = weight/m² height) is a simple index of weight-for-height that is commonly used to classify obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m²). According to the WHO definition, a BMI of 18.5 to 24.9 is considered to be normal weight; a BMI of 25 to 29.9 is overweight; and a BMI of ≥ 30 is obesity (≈ 11%).

In 2014, worldwide, more than 1 billion adults (≥90%), 18 years and older, were overweight or obese. Of these, over 60 million adults (≥10%) were obese [2]. Overweight and obesity are leading risks for global death. In 2010, worldwide, it has been estimated that around 3.4 million adults died (80% of total death) as a result of being overweight or obese [3]. In addition, 44% of diabetes cases, 23% of coronary heart disease cases and 7% to 41% of certain cancer cases are attributable to overweight and obesity [4]. A recently published systematic review has determined that this chronic burden of obesity is associated with a substantial economic burden, there is an urgent need for public health measures in order to save societal resources [5].

Thus in conclusion, published obesity models lack information on the predictive quality of the applied event simulation approaches.

Methods

The underlying systematic review was conducted according to the PRISMA guidelines [8].

Details on the underlying methodology of this systematic review are described in detail elsewhere [9], hence below only a short description of the methodology is provided.

Eligible studies were decision models for full health economic assessment in the context of the prevention and / or therapy of obesity.

Data Extraction: For each included study we extracted information on the external event validation approach, using the best practice recommendations of the report on “Model Transparency and Validation” issued by the ISPOR-SMDM Modeling Good Research Practices Task Force.

This included information on the availability of the external validation cohort (obesity cohort or other), on the systematic identification and suitability of data sources on the dependency of the external data sources (i.e. whether those used in the model simulations) and on the justification of the data source selection (due to predefined criteria).

Furthermore we extracted information on whether the external validation results were provided for each source separately, whether present in the reported results of the model simulations (versus those used in the model simulations) and on the justification of the data source selection (due to predefined criteria).

Discussions

1. Of 87 papers identified on decision models for full health economic assessment in obesity, 83% (72 of 87) simulated obesity-associated events. Most of these models simulated CHD (74%; 60 of 72), T2D (74%; 53 of 72), and stroke (65%; 47 of 72).

2. One key limitation of these models is the lack of published external validation results which could provide valuable information on the predictiveness, and hence on the quality, of their event simulation approaches.

3. Only ten models performed an external validation and the predictiveness of the event simulation was investigated in a cohort of obese subjects for only one. All others used obese or general populations as basis for the validation, consequently no insights on the predictiveness of the applied event simulation approaches in obese subjects could be provided.

4. Accordingly, one limitation of our (current) findings is that the published models identified do not provide sufficient insights into the quality of the event simulation approach. In order to investigate the quality of the different methodologies applied we need to perform some additional research steps. This means that we will need to rebuild/reprogram the key event simulation approaches, feeding the rebuilt models with comparable patient population and intervention effect data and performing an extensive validation that compares the model-based event simulations to long-term epidemiological observations in the field of obesity.

Conclusions

We have found that only a limited number of published decision models for full HEAs in obesity have applied an external event validation. In addition, those who conducted external validation suffers from major limitations including the data source selection process; as only one case, obesity cohorts were used as basis for the event simulation procedure.

Thus in conclusion published obesity models lack information on the predictive quality of the applied event simulation approaches.

References