Development of a new outcome measure to assess the impact of reduced-risk tobacco- and nicotine-containing products on health and functioning: a comprehensive literature search

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Introduction and objectives

Smoking cigarettes is a leading cause of preventable, premature morbidity and mortality worldwide. In an effort to reduce smoking-related population harm, tobacco harm reduction has been increasingly recognized as a valuable and promising approach to this public health problem [1-3].

Tobacco harm reduction is based on the approach of moving from one end of the risk continuum of tobacco and nicotine products (TNP) to the other, for example switching cigarette smokers to alternative, less harmful products, also known as Reduced-Risk Products (RRP)*.

In light of tobacco harm reduction strategies and the increasing availability of RRPs, it is important to:
- Assess changes in health status of individuals who switch from cigarettes to less harmful alternative tobacco and nicotine products [4].
- Consider that health and functioning are two relevant dimensions that are likely to be impacted by TNP use behavior and are key dimensions to evaluate RRPs' impact on public health [5].

Including and giving weight to patient-reported outcomes (PRO) is particularly important in that context, as ratings of RRP effectiveness or adverse events may differ from clinical measures. To date, there are no available validated measures specific to tobacco-related outcomes.

The proposed research project aims to develop a new outcome measure that would accurately reflect the health and functioning of individuals who use any TNP across the risk continuum.

The World Health Organization's International Classification of Functioning, Disability and Health (ICF) [6] and the Wilson and Cleary model of Health-related Quality of Life [7] are being used as guiding frameworks for the development of the measure. Benefits of using the ICF and the Wilson and Cleary model have been largely acknowledged, as they offer a comprehensive conceptualization of health, functioning, and impact. In addition, the best practice guidelines from the U.S. Food And Drug Administration (FDA) on PROs [8] will be followed to ensure a robust, relevant, valid, and reliable measure.

Here we describe the first step in identifying key concepts for measurement instrument development: a comprehensive literature review.

Methods

Qualitative and quantitative literature searches (Table 1) were conducted in PubMed and Google Scholar to identify key quantitative and qualitative research publications related to the positive and negative health impact of TNP use, including:
- Key concepts related to the positive and negative impact of TNP use
- Self-reported measures that assess the concepts identified
- Methodologies used to develop ICF-based questionnaires and related concepts and questions; this search was not limited to TNP use.

Additional articles were found based on internal and external reports (Figure 1).

Abstracts were screened with SWIFT-Active Screener [9], which included:
- Screening references in duplicate for the first 100 studies for calibration
- Single-screening of remaining references
- An independent reviewer screening a random subset (n = 50) of these studies for quality check
- Titles and abstracts screened until an estimated 95% recall was achieved.

| Table 1: Search terms for qualitative and quantitative studies specific to the negative or positive impact of TNP use (2008-2018; human subjects, searched article title, abstract, author key words, English only)	
Search No.	Search Terms
1	Smoke OR Smoking Or Tobacco OR Nicotine OR E-cigarette OR Vaping OR Snus OR Snuff OR Smokeless OR Smoking Cessation OR Waterpipe OR Hookah OR Novel tobacco product OR Modified risk tobacco product OR Reduced risk tobacco product
2	Symptom* OR Impact OR Burden OR Effect OR Quality of life OR QOL OR Well-being OR Lived experience OR ICF OR Environment OR Benefit OR Functioning OR Stress OR Activity of Daily Living or ADL OR Benefit OR Mental Health or Depression OR Anxiety OR Health status OR Cognition OR Concentration OR Memory OR Mobility OR Physical functioning OR Pain OR Discomfort OR Self-care OR Hygiene OR Getting along OR Social support OR Social functioning OR Stigma OR Role functioning OR School OR Work OR Productivity OR Leisure OR Volunteer OR Disability OR Health OR Self-esteem OR Self-confidence OR Self-efficacy
3	Qualitative OR Interpretive phenomenological analysis OR IPA OR Thematic analysis OR Grounded theory OR Content analysis OR Discourse OR Interviews OR Focus groups OR Ethnograph*
4	Quantitative OR Measure OR Questionnaire OR Patient reported outcome OR Health outcomes OR Instrument OR Diary OR Outcome OR Scal Quantitative OR Measure OR Questionnaire OR Patient reported outcome OR Health outcomes OR Instrument OR Diary OR Outcome OR Scale OR Survey OR Rating scale OR Linear scale OR Visual analogue scale OR VAS OR Index OR Outcome assessment OR Clinical outcome assessment OR ICF OR International Classification OR International Classification of Functioning OR WHODASe OR Survey OR Rating scale OR Linear scale OR Visual analogue scale OR VAS OR Index OR Outcome assessment OR Clinical outcome assessment OR ICF OR International Classification OR International Classification of Functioning OR WHODAS

Results
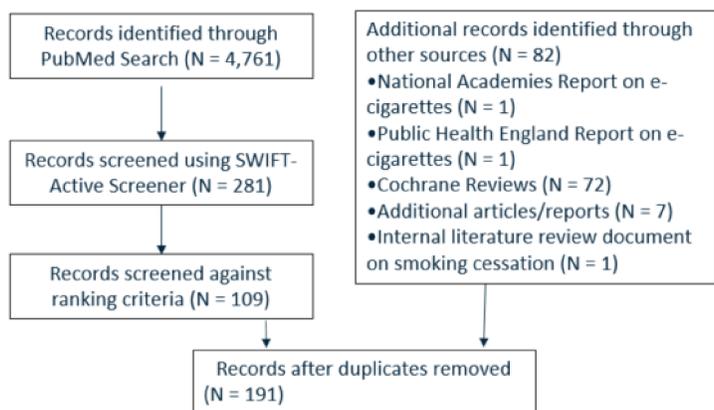
Figure 1: Literature flow diagram

Results

Articles were screened for positive and negative health impacts.
- 92% focused on **smoking tobacco**.
- 15% focused on **alternative forms of tobacco or nicotine products**.
- 43% focused on **smoking cessation**.

The preliminary conceptual model from the literature review is presented in **Figure 2**.

Reviews of internal smoking cessation reports suggested an increase in short-term health benefits of smoking cessation, including:
- Increased exercise capacity, respiratory function, and endothelial function
- Decreased erectile dysfunction and respiratory symptoms.

In addition, smoking cessation resulted in short-term impacts, including:
- Increased appetite
- Difficulty concentrating
- Emotional symptoms (anxiety, frustration, anger).

However, Cochrane reviews suggested that interventions for smoking cessation reduced withdrawal symptoms.
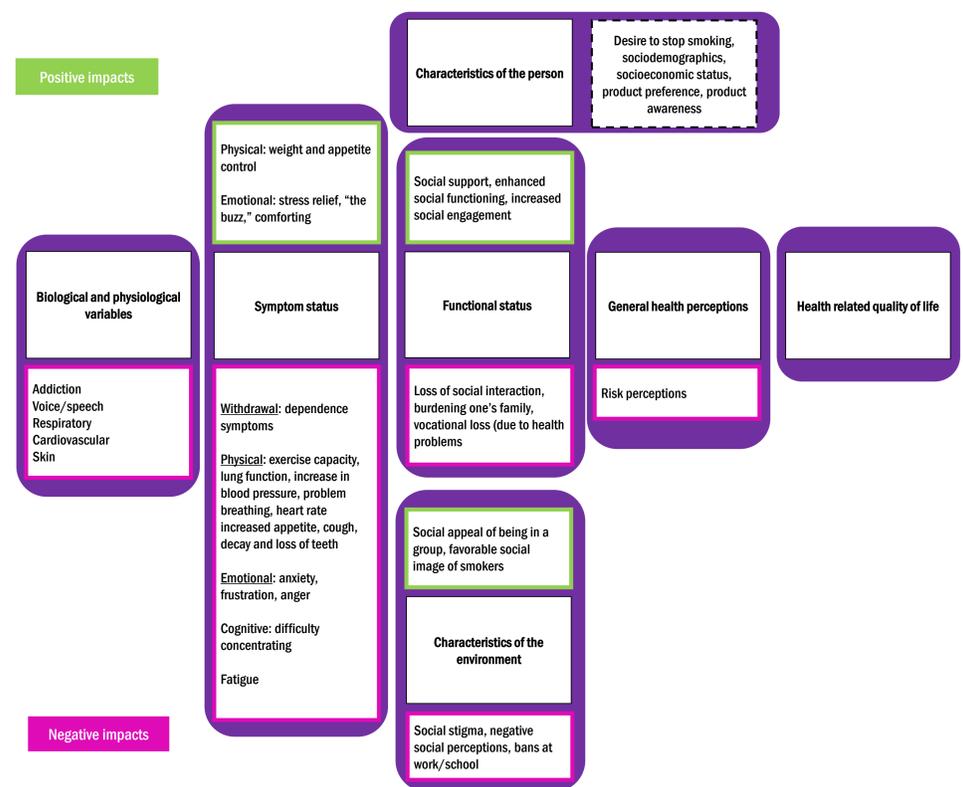

Figure 2: Draft conceptual model: findings from literature review

Discussion

Expected outcomes and implications
- Information and data extracted from relevant literature informed the development of a preliminary conceptual model of the impact of TNP use on health and functioning.
- This initial conceptual model was further informed by a review of in-house qualitative research focused on dependence and perceived risk and refined by nine experts in the fields of health, functioning, nicotine dependence, PROs, and health-related quality of life.

Next steps will include:
- Mapping identified self-reported instruments to the preliminary conceptual model to identify gaps in current measures
- Conducting concept elicitation studies with TNP users who switch from smoking to RRPs to further identify potential short- and long-term benefits and impacts
- Confirming the relevance of the concepts in Asia, where uptake of RRPs has been high.

Conclusions

- The final conceptual model resulting from the triangulation of the literature, expert opinions, and consumer input will be used to generate a draft instrument that will be evaluated following the U.S. FDA's processes for the development of a PRO instrument.
- The instrument is intended to be used in observational, clinical, and longitudinal studies of RRPs compared to other commercially available TNPs and smoking cessation.

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*Footnote: Reduced-Risk Products ("RRPs") is the term we use to refer to products that present, are likely to present, or have the potential to present less risk of harm to smokers who switch to these products versus continued smoking. We have a range of RRPs in various stages of development, scientific assessment and commercialization. Because our RRPs do not burn tobacco, they produce far lower quantities of harmful and potentially harmful compounds than found in cigarette smoke.

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