Identification of remarkable dimensions in management and evaluation of Non-communicable disease programs  
A systematic review and Meta-synthesis  
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Abstract  
Objectives: This study aimed to identify indicators of proper program development by systematically reviewing existing literature. Methods: In this systematic review, PubMed, Scopus, EMBASE, Web of Science, Google Scholar, Cochrane library, ProQuest, and grey literature were searched. The search was limited to literature published between January 2000 and January 2019. Results: Forty articles were found relevant to the study objectives. data were obtained based on context, input, process, product (CIPP) model through these articles. 7 dimensions for context, 5 dimensions for input, 4 dimensions for process, and 6 dimensions for the product were identified. Conclusion: According to CIPP dimensions, some indicators such as program definition, appropriate organizational culture, structure and evaluation must be considered to develop an appropriate program to improve health services.
Keywords: Management, evaluation, indicator, development programs, CIPP model

Advances in Knowledge
- Based on the findings of the current systematic review, a number of indicators were obtained which can be used as components of program development or preconditions of the program.
- Indicators can be helpful in developing programs and providing health system policy makers and decision-makers with criteria for input, process and product area to evaluate programs.

Application to Patient Care
- This study identified dimensions in the programs which should be addressed to increase public awareness of risk factors and to reduce risk factors.
- This study addresses a number of criteria to which would help policymakers in decision making, reducing costs of living in the community, strengthening communication, promoting community and institutional participation, and providing necessary information for the development of a better program which consequently leads to better and more useful services to the patients.

Introduction
In recent decades, one of the challenges to the health system is non communicable diseases.¹ In the twenty-first century, non-communicable diseases (NCDs) are the leading global challenges in public health which result in poor health, economic loss, life loss, diminished quality of life, and poor social development.² By 2025, NCDs will account for over 70% of all deaths globally based on the projection of the World Health Organization (WHO).³ it is estimated that 41 million people in countries with low-resource potentials will die from NCDs by 2025, mainly due to cardiovascular diseases (CVDs) (48%), cancers (21%), chronic respiratory diseases (12%), and diabetes (3%).⁴

WHO has predicted that appropriate interventions will prevent the spread of non-communicable diseases.⁵ Coping strategies for non-communicable diseases include interventions to reduce risks to the general public and the community. These interventions change health behaviors by
providing interactions among health care providers and recipients of these services through legislation, financial and tax incentives, and public health promotion. In this regard, organizations will be responsible for managing and controlling non-communicable diseases. Despite these activities in the field of non-communicable diseases, the incidence and prevalence of these diseases have not yet decreased significantly.

A systematic approach to prioritizing, decision making, managing, improving interventions and community-based strategies would be necessary to develop a program for managing non-communicable diseases considering limited resources available in developing countries. Managerial bodies in the field of non-communicable diseases have to take a participatory approach relying on sound scientific evidence to merge information and to set long-term plans. Developing a proper plan depends on setting goals and priorities and the way they are shaped to provide a clear vision of the future. To this end, development plans are based on such factors as awareness of the external environment, the parent organization, and the necessary mechanisms.

One of the important issues within the development of the program process is determining the success rate of the program goal achievement. To influence activities and actions, developing the program requires continuous monitoring and evaluation and ensuring the movement within the designated framework.

Dimensions of program management and evaluation include raising community awareness, improving indicators and performing special interventions to reduce risk factors for non-communicable diseases, conducting applied research in the field of control and prevention of non-communicable diseases, improving cooperation and participation in the prevention and control of non-communicable diseases, establishing a system to track and evaluate progress in the field of control and prevention.

Evaluation helps to compare actual situations with expected outcomes of managers and policy makers toward goals and objectives. We can apply different assessment patterns including time-Cost Models (such as Half-Life Chart - Score Model), models of organizational excellence and self-evaluation (such as Deming model, quality audit model, Malcolm Baldridge quality model, organization excellence model), integrated models (such as smart system, performance
The CIPP model is a comprehensive, functional model that considers all aspects of the program or system. The CIPP evaluation model is one of the most recommended frameworks for the conception, design, implementation, and assessment to improve decisions emphasizing constructive evaluation during the evolutionary steps of a program. The four components of this model include context, input, process, and product. The CIPP model, by collecting regular information during the development and implementation contributes to the program evaluators.

Considering the prevalence of non-communicable diseases and the many problems caused by the chronic, progressive and debilitating nature of the diseases and various responses from the health system to focus on prevention with non-communicable disease priority, programs in the field of NCDs have not been very successful in the implementation. To develop a suitable program some aspects such as accessibility, quality, efficiency, and equity which leading to the promotion of health services and a healthier community was considered. Therefore, this study aimed to identify significant dimensions of developing programs for the management and evaluation of non-communicable diseases through a systematic review of existing literature.

**Methods**
The present study is a systematic review of existing literature which aimed to identify dimensions of evaluation and management of non-communicable diseases.

**Research questions**
Two questions were selected for the study: 1) What remarkable dimensions should be used for the management of programs for non-communicable diseases?; 2) What dimensions should be used for the evaluation of programs for non-communicable diseases?

**Search strategy (Data sources and literature search)**
To identify relevant studies, selected keywords were searched in PubMed, Scopus, EMBASE, Web of Science, Google Scholar, Cochrane library, and ProQuest. Grey literature was searched from January 2000 to January 2019. Also, Grey literature was searched through Cochrane and
ProQuest. After removing articles that met the exclusion criteria, to increase the sensitivity and to identify all relevant studies, the references were checked and finally led to the inclusion of three more articles. Keywords used to search the relevant literature included (Evaluation OR assessment OR appraisal OR measurement OR audit OR accreditation), (Developing program), (Non-communicable disease OR health system), (Framework OR model OR scheme OR pattern OR mechanism OR system), (Non-communicable disease* OR Diabetes OR Respiratory disease OR Heart disease OR Cancer Disease) and (Management model OR Management pattern OR Management framework OR Management theory of diseases OR Disease management policy).

**Inclusion criteria**

*The following criteria were used to select relevant studies*

Articles published between January 2000 and January 2019 in English, studies which focused on the management and development of programs in the non-communicable disease field, studies related to the evaluation of the health and national plans developed for the evaluation and management of NCDs, and ultimately studies which employed evaluating models for the health services.

**Exclusion criteria**

Studies published in other languages, studies in the area of program implementation, performance evaluation studies unrelated to the research question, and studies which were published before 2000.

**Study screening process**

The first selected keywords fed into the database search boxes and, in some databases, the search was limited to abstracts and titles. Search results of keywords were checked by a team member for the inclusion criteria; in cases of uncertainty, decisions were made based on consensus. After identifying unrelated articles and removing duplicated ones, the titles of the selected article imported into an Excel spreadsheet. The abstracts that met the inclusion criteria and closely related to the aims of the present study were reviewed and unrelated ones were removed. Intimately related articles were employed in the final step of analysis after obtaining a minimum quality score based on the “Strengthening the Reporting of Observational Studies in
Epidemiology” (STROBE) statement. Finally, the full text of selected articles was downloaded and if it wasn't a free access article, it would be purchased by the Kerman University of Medical Sciences Central Library.

**Quality Control**
Qualitative evaluation, selection of related articles, and data collection were performed by two researchers separately (FA and LV). Selected articles were qualitatively evaluated by researchers using the STROBE checklist. Any disagreement by the two evaluators referred to a third person (MA). This checklist consists of 22 different sections following which various aspects of methodology were evaluated including sampling methods, measuring variables, statistical analysis, modifiers of confounders, validity and reliability issues of the tools used, and study objectives. Since all articles did not exactly match the Strobe checklist, scores were calculated as a percentage and the acceptance threshold was considered a minimum score of 65%. Accordingly, studies that acquired a minimum score (65%) from the checklist questions were included and the related data extracted to perform the meta-synthesis process.

**Data analysis**
For each study, data on the article title, first author, year of publication, place of the study, and the prerequisites for program development were extracted and manually entered into the Excel spreadsheet. Meta-synthesis was done by collecting data from articles based on the dimensions of the CIPP model.

**Ethics and dissemination**
This study is a part of PhD thesis in health care management at Kerman University of medical sciences which has not yet been completed. This study was approved by the research ethics committee of Kerman university of medical sciences (Code: IR.KMU.REC.1399.272).

**Results**

**Literature search**
A total of 6633 articles were extracted at the initial search of electronic resources. Of which, 1835 duplicated articles were removed, 4798 relatively related articles remained, and 3035
studies excluded after evaluating the titles and abstracts, 1763 potentially related studies remained and 706 articles were excluded after restricting search. This restriction was done by setting a time limit, restricting keywords, and searching only titles and abstracts. 1057 studies selected for text retrieval of which, 1003 were removed after text retrieval, and 52 studies were selected for the evaluation of inclusion and exclusion criteria; 18 articles were set aside after reviewing inclusion and exclusion criteria. Finally, 36 studies were selected for the analysis process (Figure 1).

**Literature search and study selection process**

Based on the above-described process thirty-seven articles were reviewed. Of which, five were national programs. A total of one hundred and thirteen authors’ participation were recorded. Five articles were from the United States, four from South Africa, three from Iran, and three from Bangladesh which were published in twenty-nine journals. The first paper was published in 2005 and the latest one in 2018, six articles were published in 2017 and six articles in 2018.

**Meta-synthesis**

Meta-synthesis was performed according to the CIPP model. First, the content of articles and documents was analyzed and all components related to management and evaluation of non-communicable disease programs were placed based on the relationships among four dimensions; context, input, process, and product. Finally, 7 sub-categories in the context dimension, 5 sub-categories in the input dimension, 4 sub-categories in the process dimension, and 6 sub-categories in the product dimension were identified.

**Results of included studies**

Meta-synthesis was done based on the CIPP model relying on which the program development precondition was extracted. According to the above model prerequisites for program development comprise four dimensions; input, context, product, and process which are depicted in table 1. Subcategories and preconditions were taken into account for those four dimensions. It is noteworthy mentioning that dimensions, subcategories, and prerequisites are related to the definitions of the CIPP model. In the context dimension the relevant elements in the environment were placed as an attempt to identify problems, needs, and opportunities in the environment.¹⁹
Input was evaluated to specify and to assess the existing capabilities, possible program strategies for the goal achievement, intended methods for implementing strategies, organizations, methods, and other resources, including budget and time.\textsuperscript{20}

Process evaluation is done to identify or to predict executive problems during the activities related to the field of non-communicable diseases and the desirability of the process of implementing these activities.\textsuperscript{20} In the output evaluation, the results were measured against the goals of the program and the relationship between expectations and actual results. In this study, the findings were categorized based on the definitions of the four dimensions. Context dimension showed the subsets of the context for program development. They include the objective (stages of development, clarity, the feasibility of implementation, and coverage), the program (development, coverage and nature), the mission, guidelines, technology, culture, and organization. The input dimension includes executive strategies, resources (human, equipment, financial), structure (physical, programmatic), teaching and learning. Process dimension includes responsibilities, communications, management, and leadership. Product dimension includes the benefits of change in the organization, health promotion, resource use effectiveness assessment, people assessment, work progress assessment, and information system evaluation.

**Discussion**

This study attempted to identify important and effective components of management and evaluation of the programs in the field of non-communicable diseases for the use in developing and evaluating programs of non-communicable diseases and creation of a responsive system. The findings were synthesized based on the CIPP model. In this part, the components identified in this study were examined based on four dimensions of the CIPP model.

In the context dimension, factors such as the objective, development and coverage program, the mission, guidelines, technology, culture, and organization were studied. In this dimension, one of the prerequisites was to consider the process of developing program objectives appropriately as well as checking clarity, the feasibility of implementation and coverage. Peykari et al. (2017) stated that clear and appropriate goals should be considered in developing national plans. Referring to a national program for the management and control of risk factors, they believe,
developing an operational plan and roadmap, as well as providing accountability through political commitment is one of the success factors. Category of technology could be considered as an appropriate way in the development of the program, in this regard, Sankaranarayanan (2009) believes that most technological responses to address personnel shortages and problems of access to health services, focus on NCDs programs. For example, demonstrated the effectiveness of using cellphone applications to check patients’ compliance with medication regimens for managing diabetes and asthma.

In the input section, some dimensions including executive strategies, resources, structure, teaching and learning have been presented. In developing non-communicable programs one of the cases to be considered is a resource (human, equipment, financial). Nishtar (2010) believes a focus on human resources for health (HRH) in the context of NCD control could be a lever for health system change after 2015 which led to the measures designed to improve health systems more broadly. HRH is also an important lever in post-2015 efforts for the attainment of UHC. Of all the health system resources, the most strategic ones are human, physical, technological, and financial. Human resources can make changes in the health system on a collective or individual basis. In program development, providing appropriate physical and programmatic structure such as municipal commitment to creating public services, providing services centers, and creating an organizational structure is required. In this regards, Planning Commission of India (2003), to achieve maximum impact on NCDs, we should integrate both horizontal (such as public health and social welfare) and vertical (strategies focusing on populations like controlling risk factors) programs.

Process dimension which illustrates the process dimension for program development includes responsibilities, communications, management, leadership. One of the prerequisites for program development is that communications and multi-sectoral collaboration are taken into account. In this regard, the political statement at the United Nations (2012) stated that since non-communicable diseases resulted in higher costs and lower productivity for families, individuals, and societies, coordination and multi-sector Communications to resolve the problems through promoting tools to identify and mobilize sufficient funds is essential. And also Australian National Preventive Health Agency (2010) Cited that cooperation in health matters was
important and one should draw a distinction between processes designed for cross-sectional coordination and official means of increasing involvement of different sectors.²⁵

Management of program development includes detecting, screening, and treating these diseases, and providing access to palliative care for people in need. Sarink et al (2016) concluded that Coronary Artery Disease (CADs) could be controlled by engaging the public in policy-making, organizing, coordinating and financing. We can evaluate public involvement in making policies by rules and regulation, so a management framework comprising of legislation, regulations, and screening, and he public education seems necessary for preventing and controlling cardiovascular diseases.²⁶

Product dimension which shows the dimensions of the product for the program development includes the benefits of change in the organization, health promotion, resource use effectiveness assessment, and assessment. Monitoring through NCD's information system and data was found important in program development, similarly, the strategic plan of Bangladesh (2007-2010) claimed it would emphasize on non-communicable disease surveillance mechanism through the National Health Information System that generates data and publish them in the databases form which provide access to information for policymakers, public health managers and researchers in other countries.²⁷ One of the prerequisites in the product dimension is the issue of health promotion which can be met through appropriate interventions and accountability, promoting available resources and infrastructure, integrated care, documentation and monitoring of activities, multi-sectoral, support of policymakers, program managers, and providers. In a study by Diem et al (2016) the role of capacity building was achieved by a comprehensive approach to public health interventions such as creating processes of improvement, knowledge production, increasing need evaluation, examining the characteristics of the target population, identifying the resources and procedures needed to implement.²⁸ Mondal et al. (2018) stated that through appropriate approaches towards interdisciplinary leadership, a shift from treatment to prevention, guidelines development on interdisciplinary communication education, community access, and investment within the world framework has taken a healthier approach to accountability²⁹ whose items listed above are prerequisites for developing a program in the product dimension.
It is worth noting that in program development it is crucial to have common responsibility and proper communication among the stakeholders including community members, health professionals, and non-health organizations, health and non-health associations, municipalities, private sector, religious leaders, nongovernmental and local leaders, the ministry of education. Today, global health due to the prevalence and incidence of non-communicable diseases is in a state of crisis and the health system is trying to respond to this crisis. Proper planning and management are essential at all levels (primary, secondary and tertiary) in all types of organizations (public, private and non-profit). Therefore, to develop, implement, and evaluate the appropriate program, a framework and mental concept should be considered in a comprehensive view of all effective factors to promote community health.

This study considered the components of an appropriate program development systematically. Although existing literature has already considered the dimensions of developing a program in detail, a comprehensive review does not exist, so this study improves the current knowledge of this field by collecting and categorizing all necessary dimensions for developing a program.

Limitations
In this article data were collected based on the CIPP model, we appreciate that other models are available for this purpose, using any other one might change the results, limited access to the full text of some articles and documents could be the reasons why some studies have not been reviewed since the researcher did not have access to Grey literature. The fact for which it was decided to review less robust evidence was that developed programs such as national and strategic programs could be regarded as another limitation of the present study. However, this provided us with a great opportunity to study real plans and valuable insights.

Conclusion
To sum up, remarkable dimensions are essential for program development such as engaging all key stakeholders, providing required resources, addressing cultural issues. Furthermore, proper development of programs should take into account such issues as developing, implementing, and evaluating programs and all components such as contextual, input, process and product factors.
should be considered. This study provides good information for policymakers and planners to develop appropriate programs in a sound and cost-effective manner.

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Figure 1: Flow diagram of study selection

Google scholar English (n= 200) → The total number of articles from a basic search of electronic resources (6633) → Cochrane library (n= 283)

PubMed (n= 1888) → Web of science (n= 349)

EMBASE (n= 912) → Scopus (n= 2815)

Delete duplicated articles retrieved from different databases (n=1835) → ProQuest (n= 186)

Relatively related articles (N= 4798) → studies deleted after evaluating the titles and abstracts (n=3035)

potentially related studies (N=1763) → Deleted articles after restricting search (n= 706)

Studies selected for text retrieval (N=1057) → Deleted articles after text retrieval (n= 1003)

Studies selected for evaluation of inclusion and exclusion criteria(N=52) → Articles deleted after reviewing inclusion and exclusion criteria (N= 18)

Articles entered into the study by reference review (n=2) → Studies selected for analysis process (n=36)
Table 1: context, input, process and products dimensions necessary for plan developing

<table>
<thead>
<tr>
<th>dimension</th>
<th>subcategory</th>
<th>prerequisites</th>
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<tr>
<td>context</td>
<td>Objective</td>
<td>stages of development</td>
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<td></td>
<td>clarity</td>
<td>Considering realistic, clear trending in goal development</td>
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<td></td>
<td>the feasibility of implementation</td>
<td>The feasibility of implementation via considering adequate resources</td>
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<td></td>
<td>coverage</td>
<td>Achieving health system goals, improving community health, reducing health inequality, identifying budgets and creating accountable systems</td>
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<td>International databases and targets, surveillance organization, non-communicable disease control and prevention centers</td>
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<td>The program</td>
<td>development</td>
<td>Partnerships, clear policies, specific strategies and activities, stakeholders, outcomes, evaluation criterion and resource</td>
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<td></td>
<td>coverage</td>
<td>Developing intervention programs</td>
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<td></td>
<td>nature</td>
<td>Developing operational plan and roadmap</td>
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<td>Developing programs at national and international level</td>
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<td>Covering long-term, short-term and mid-term standards in the field of home, schools and workplaces health</td>
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<td>The mission</td>
<td>Development</td>
<td>Developing policies and documents aimed at capacity building, accessibility enhancement, cost reduction, careful monitoring and evaluation, multi-dimensionality, political commitment and prioritization.</td>
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<td>Guidelines</td>
<td>Developing guidelines in the areas of managerial, economic, social, legal and goal-based protocols</td>
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<tr>
<td>Technology</td>
<td>Information technology and tools</td>
<td>Application of multilateral information and communication technology, management and decision support system, metadata technology and data integration and media usable technology</td>
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<td></td>
<td>Technology in the field of people and culture and community</td>
<td>National and international collaborative innovative approaches</td>
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<td>Culture</td>
<td>Motivation</td>
<td>Attention to organizational incentives and creating a reward system to encourage initiatives and increase stakeholder confidence</td>
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<td></td>
<td>Culture</td>
<td>Investigating beliefs, ethnography, and identifying the impact of cultural factors on risk factors</td>
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<td>Organization</td>
<td>Accessibility</td>
<td>Access to diagnostic, treatment and essential medicines</td>
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<td></td>
<td>Geographical access</td>
<td>Access to the right budget</td>
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<td>Prioritization</td>
<td>Participatory prioritization considering environmental, social and cultural, legal, political contexts prioritization through motivating, successful processes, stakeholder engagement and coordination</td>
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<td></td>
<td>Prioritization through infrastructure identification and priority mechanisms (process, tool, method), use of evidence and public values</td>
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<tr>
<td>Input Executive strategies</td>
<td>Developing international and national clinical guidelines to reduce disability, mortality, disease burden and appropriate design of intervention packages</td>
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<td></td>
<td>Developing training guidelines for accountability and formulating policy tools to reduce risk factors of women's health, children, agriculture, sport, transportation, regulatory organization</td>
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<td>Developing comprehensive interdisciplinary guidelines to implement effective, integrated, sustainable and evidence-based policies, human resources mobilization, research, monitoring and managing complex cases</td>
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<td></td>
<td>Developing strategies to improve municipal performance (Commitment to create public services for recreational spaces and parks), transportation, education (Promoting Healthy Programs in Healthy School Food Distribution), tax and Food Industry (Use of native agricultural products and natural foods)</td>
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<td></td>
<td>Developing global marketing strategies, trade liberalization, foreign investment and legal strategies to reduce demand (through price, tax)</td>
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<td>Resources</td>
<td>human</td>
<td>Resource mobilization and investment coordination to strengthen the human resources system</td>
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<td>Upgrading the capacity of specialist staff such as managers, physicians, nurses, health care staff and volunteers</td>
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<td></td>
<td>equipment</td>
<td>Proper investment in equipment</td>
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<td></td>
<td>financial</td>
<td>Economic and financial tools to fund equity in sectors</td>
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<tr>
<td>Structure</td>
<td>physical</td>
<td>Health Service Provider Centers, Provincial Regional Hospital, Educational Consulting Centers, Diagnostic and Pharmaceutical Centers</td>
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<td></td>
<td>programmatic</td>
<td>Redesigning the system with the aim of socializing and collaborating, accessing services, supporting clinical information, self-management, managing and supporting technology and equipment, and creating an organizational structure consisting of different stakeholders.</td>
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<td>Process</td>
<td>Responsibilities</td>
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<td>Teaching</td>
<td>Increasing awareness through the authority delegated to local organization to increase education and information for stakeholders and patients</td>
<td>National and international training programs for professionals, students, policymakers and clients and build up a comprehensive participatory approach to development aid in education and knowledge, beliefs, attitudes and skills for individuals</td>
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<tr>
<td>Learning</td>
<td>Developing scientific and evidence-based knowledge with the help of specialized public and private institutions to create a favorable environment for empowerment</td>
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<td>Level of Service Provision</td>
<td>Communication at different levels of society, family and individuals, agriculture, environment, industry (coordination of administrative and non-administrative structure of tobacco laws, alcohol), education, economy, nutrition, media, urban planning, Ministry of Information (For information), collaboration between various departments of the Ministry of Health, religious organizations, trade unions, the insurance industry (private and public), universities, policymakers and community leaders</td>
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<td>Management</td>
<td>Strong leadership aimed at creating comprehensive policies (national and international) and monitoring activities</td>
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<td>Leadership</td>
<td>Use of scientific evidence and dissemination of information, goals, attention to multidisciplinary and stakeholder environments, fairness of integrated actions and essential interventions</td>
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<td>Benefits of change in the organization</td>
<td>Appropriate interventions and accountability, promoting services based on available resources and infrastructure, resuscitation and reorganization of health services, early diagnosis, and integrated care, documentation and monitoring of activities, multi-sectoral participatory interventions, support and sensitization of policy planners, program managers and providers.</td>
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<tr>
<td>Health promotion</td>
<td>Development of operational plans, implementation strategies and roadmaps</td>
<td>Increasing the role of the government as a supervisor of efficient and integrated prevention and control policies, allocating multilateral resources and plans and monitoring framework for plans and guidelines</td>
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<td>Resource Use Effectiveness Assessment</td>
<td>Cost Effectiveness of Resources, National Health Reporting System from annually, monthly and periodically</td>
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<tr>
<td>People Assessment</td>
<td>Feedback of evaluation results to contacts</td>
<td>Assessment of trends and outcomes of interventions at individual, social, and environmental levels</td>
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<td>Work Progress Assessment</td>
<td>Evaluation and monitoring of the priorities identified and work progress, integrated disease management and making the best decision</td>
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<td>Information system evaluation</td>
<td>Monitoring through NCD information and data</td>
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<td></td>
<td>Strengthen monitoring and evaluation in the area of education, research and regional strategies</td>
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