MD Program
UNIVERSITY OF TORONTO

Office of Faculty Development

Blueprinting for Clerkship Course Mastery Exercises

This approach to blueprinting is based on Sylvain Coderre, Wayne Woloschuk & Dr Kevin McLaughlin (2009) Twelve tips for blueprinting, *Medical Teacher*, 31:4, 322-324, DOI: 10.1080/01421590802225770 and integrates parts of the Medical Council of Canada Examination blueprint. An earlier version of a Blueprinting Primer by Dr. Richard Pittini also informs this process.

What is Blueprinting?

Blueprinting is a method of planning assessments that clearly demonstrates what content is covered in your course and the emphasis placed on each content area in your assessment. It is analogous to **a recipe that builds your test**.

Blueprinting can apply to overall assessment frameworks or to specific tests. For our purposes, the blueprint for the course should **reflect the overall assessment framework**; that is, the blueprint should represent all test components for a course (e.g., written, and oral, if both exist).

Why is Blueprinting Important?

A blueprint ensures that assessments have content validity. This means that **the test assesses what it is intended to assess**. This is important for both test developers and the students taking the test. It is a means of optimizing the alignment between learning objectives and their assessment.

A blueprint **avoids a haphazard or inconsistent approach** to test generation so that tests are consistent between groups of students taking the test during different rotations. Just as important, a blueprint is a guide for creating the most effective tests to accurately measure students' success in mastering the course material.

The process of blueprinting also enables us to **identify gaps** in the curriculum. Questions that are created in order to fit the blueprint may, for example, test content that is not actually covered in course material (e.g., health promotion and illness prevention, constraints including special populations and social determinants of health).

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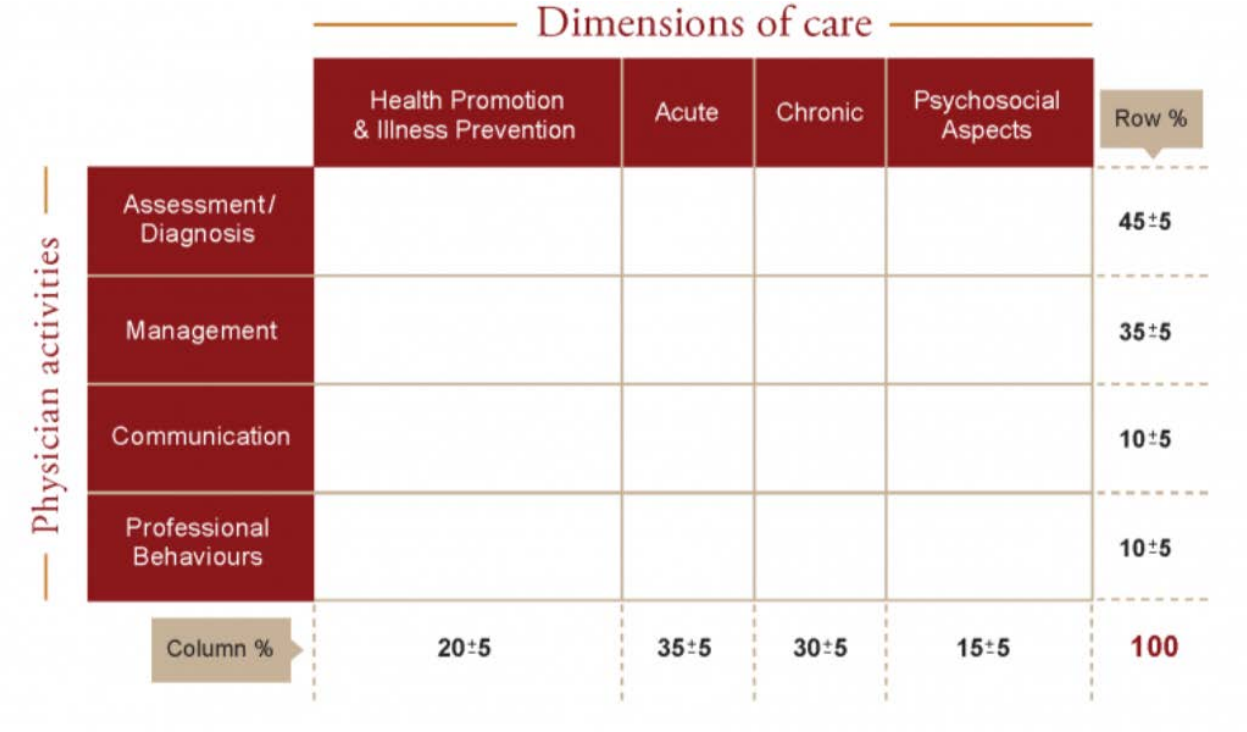
BACKGROUND: MCC BLUEPRINT AND ITS INFLUENCE ON CLERKSHIP BLUEPRINT FOR MD PROGRAM

In 2014, the Medical Council of Canada (MCC) published a report outlining their new blueprint and content specifications. A two-dimensional common assessment blueprint was proposed for both the MCCQE Step 1 and Step 2 examinations, with the focus on **Physician Activities** and **Dimensions of Care**.



PHYSICIAN ACTIVITIES

***Assessment/Diagnosis**:* Exploration of illness and disease using clinical judgment to **gather**, interpret and **synthesize** relevant information that includes but is not limited to **history taking**, **physical/mental status examination and investigation**.

***Management**:* Process that includes but is not limited to generating, **planning**, organizing safe and effective care in collaboration with patients, families, communities, populations, and other professionals (e.g., finding common ground, agreeing on problems and goals of care, time and resource management, roles to arrive at mutual decisions for treatment, working in teams).

***Communication**:* Interactions with patients, families, caregivers, other professionals, communities, and populations. Elements include but are not limited to relationship development, intra-professional and inter-professional **collaborative care**, **education**, **verbal communication** (e.g., using the patient-centered interview and active listening), **non-verbal and written communication**, **obtaining informed consent**, and disclosure of patient safety incidents

Professional Behaviours: Attitudes, knowledge, and skills relating to clinical and/or medical administrative competence, communication, **ethics**, as well as societal and **legal duties**. The

wise application of these behaviours demonstrates a commitment to excellence, respect, integrity, empathy, accountability, and altruism within the Canadian health-care system. Professional behaviours also include but are not limited to self-awareness, reflection, life-long learning, leadership, scholarly habits, and physician health for sustainable practice.

Dimensions of Care

***Health Promotion and Illness Prevention*:** The process of enabling people to increase control over their health and its determinants, and thereby improve their health. Illness prevention covers measures not only to prevent the occurrence of illness, such as **risk factor reduction**, but also to **arrest its progress and reduce its consequences** once established. This includes, but is not limited to screening, periodic health exam, **health maintenance**, **patient education and advocacy**, and community and **population health**

***Acute**:* Brief episode of illness within the time span defined by initial presentation through to transition of care. This dimension includes but is not limited to urgent, emergent, and life-threatening

***Chronic**:* Illness of long duration that includes but is not limited to illnesses with slow progression.

***Psychosocial Aspects**:* Presentations rooted in the social and psychological determinants of health and how these can impact on wellbeing or illness. The determinants include but are not limited to **life challenges**, **income**, **culture**, and the impact of the **patient's social and physical environment**

In addition, the MCC also includes questions in specific **Constraint** categories:

CONSTRAINT CATEGORY	DESCRIPTION	CONDITION
Complexity	Multiple morbidities	at least 10%
Age	Neonate, infant/child, adolescent, adult, adult women of childbearing age, and the frail elderly	sample across the age categories including adult woman of childbearing age and the frail elderly
Gender	Male, female	balance evenly (minimum of 40% each)
Special populations	Included but not limited to immigrant, LGBT, ability to access care, disabled, First Nation, Inuit, and Métis populations; end of life patients, refugees, inner city poor, the addicted and the homeless	representative sampling
Setting	Included but not limited to rural or remote settings, long term care institutions and home visits	representative sampling

Overview of Blueprinting at University of Toronto Faculty of Medicine

Our goal is to partially align our undergraduate assessments with the MCC blueprint. For our MD Program courses, it is important to consider specific content areas, and to then take those topics that are to be assessed and group them into categories for blueprinting. Questions from each category must be tagged to one MCC Physician Activity and one MCC Dimension of Care.

Example – Psychiatry Clerkship Blueprint

Category	Weight (%)	Marks ME/oral	*Physician Activities*			
			Assessment/ Diagnosis 45% ± 5	*Management 35% ± 5*	*Communication 10% ± 5*	*Professional Behaviours 10% ± 5*
Depressive Disorders						
Bipolar Disorders						
Major Psychotic Disorders						
Anxiety Disorders						
Trauma						
OCD and related						
Alcohol/Sedative Use						
Opioid Use						
Other substances						
Dementia						
Delirium						
Borderline/ASPD						
Other Personality Disorders						
ADHD						
Disruptive Behaviour						
Childhood Mood/Anxiety						
Psychiatric Emergencies						
Somatoform Disorders						
Eating Disorders						
Totals	**100**	**60**	**21-30**	**18-24**	**3-9**	**3-9**

Steps to Blueprinting

For simplicity, **we will prioritize content areas** (categories) along with **physician activities**. All dimensions of care should be represented in an assessment, but specific percentages of questions will not be assigned to each dimension of care. A sample blueprint with associated categories and topics for the Psychiatry Clerkship Course is included in the **Appendix**.

Step 1: Background

Familiarize yourself with the MCC Blueprint, relevant definitions and objectives, and your own course learning objectives.

Step 2: List Categories and Topics Covered in the Course

Based on your course objectives, list all **topics** covered in your course and **group them into categories**.

Topics may be specific diagnoses, skills, or presentations and the granularity of topics should be considered. The list of topics may be revised later in this process.

Categories may be loosely related to a diagnostic category, systems-based/anatomic organization (e.g., cardiovascular disease, pelvic masses) or presenting symptom (e.g., abdominal pain, headache). They will be unique to each course and may already be determined and reflected in the Tagging Categories of Exam Soft. One category may be Miscellaneous or Other.

Example

Category	Topics
Mood	Depression, Bipolar Disorders, Other Mood disorders,
Anxiety	Generalized Anxiety Disorder, Social Anxiety, Panic Disorder, Agoraphobia, Specific Phobia, PTSD and Acute Stress Disorder, OCD and related, Other Anxiety
Psychosis	Schizophrenia, Schizoaffective, Delusional Disorder, Other psychosis
Substance Use	Alcohol, Stimulants, Opioids, Other substances (Intoxication/Withdrawal/Use Disorder)
Personality	Borderline PD, Antisocial, Narcissistic, Histrionic, Cluster A Personality, Cluster C Personality

Cognitive	Alzheimer's Disease, Lewy Body Dementia, Vascular Dementia, Other Dementias, Delirium
Child	ADHD, Disruptive Behaviour Disorders, Childhood Mood and Anxiety Disorders
Other	Somatic Symptom Disorders, Eating Disorders, Suicide, Agitation, Challenging interview, Medicolegal

Step 3: Identify Categories to be Blueprinted

Identify/highlight **all specific topics that MUST be assessed** on each exam. These will constitute the categories to be blueprinted. For example, if coronary artery disease must be included on every exam, it will become a category which may then include various topics, such as angina, unstable angina, and myocardial infarction. However, if unstable angina must be included on every exam, it will constitute its own category. The remaining cardiovascular diseases might be blueprinted in a category "Other cardiovascular illnesses".

Example

Category	Topics
Mood	**Depression**, **Bipolar Disorders**, Other Mood disorders
Anxiety	GAD, Social Anxiety, Panic Disorder, Agoraphobia, Specific Phobia, **PTSD and Acute Stress Disorder, OCD and related**, Other Anxiety
Psychosis	**Schizophrenia**, Schizoaffective, Delusional Disorder, Other psychosis
Substance Use	**Alcohol**, Stimulants, **Opioids**, Other substances (Intoxication/Withdrawal/Use Disorder)
Personality	**Borderline PD, Antisocial**, Narcissistic, Histrionic, Cluster A Personality, Cluster C Personality
Cognitive	Alzheimer's Disease, Lewy Body Dementia, Vascular Dementia, Other Dementias, **Delirium**
Child	**ADHD**, Disruptive Behaviour Disorders, **Childhood Mood and Anxiety Disorders**
Other	Somatic Symptom Disorders, Eating Disorders, **Psychiatric Emergencies (Suicide, Agitation)**, Challenging interview, **Medicolegal**

Step 4: Realign Topics within Categories

Review all topics to be tested and **ensure that each is aligned with the appropriate category**. Are other **specific topics missing** and need to be included? Do additional **categories need to be created** or renamed?

For example: In psychiatry, Mood Disorders is initially a category with the following topics: Depression and Bipolar Disorder. It is decided that Depression and Bipolar Disorder should each be tested on every exam so each now must constitute its own distinct category. The categories are realigned by renaming them **Depressive Disorders,** which will include the following topics: Major Depression, Persistent Depressive Disorder, and Substance/Medical etiologies, and **Bipolar Disorders**, which will include the following topics: bipolar 1, bipolar 2, cyclothymia, and substances/medical etiologies. These topics were not originally listed in Step 2, likely because they were not substantial enough and were only later added in this step.

Step 5: Examine and Edit the Categories Marked for Blueprinting

i. Are there categories that overlap and as a result would be blueprinted twice? Is there the potential for double-dipping?

ii. Are there categories that fit better under one of the Physician Activities? (Assessment, Management, Communication, Professional Behaviours) e.g., Medicolegal issues (forms, consent, and capacity etc.) are extremely important topics in psychiatry, but they can be blueprinted under **Professional Behaviours**, as opposed to being a blueprinted category on their own. Psychotherapy is placed under Management of various disorders.

iii. Is the Miscellaneous category necessary? Should the topics in this category be blueprinted, albeit in a minor way?

- e.g., in Psychiatry, the Miscellaneous category consisted of Somatic Symptom Disorders, Eating Disorders, Medicolegal, and the minor topic of Delusional Disorder
- Somatic Symptom Disorder and Eating Disorders became categories on their own, Medicolegal issues were subsumed under the Professional Behaviours Physician Activity, and Delusional Disorder was included in a renamed Psychotic Disorders category.

iv. Are all topics aligned with the most appropriate category?

v. Are there additional minor topics that should be listed?

vi. See example in **APPENDIX** for final list of categories and topics in psychiatry clerkship.

Step 6: Determine the Relative Weighting of Categories

Rate each category according to impact and frequency in the following way:

Impact (I): Severity of presentation

- Non-urgent, little prevention/treatment potential: 1
- Serious, but not immediately life threatening: 2
- Threatening emergency (to life, others, society) and/or high potential for prevention: 3

Frequency (F): Roughly based on how commonly seen in general clinical practice

- Rarely seen: 1
- Relatively common: 2
- Very common: 3

The relative weighting of categories is the **percentage of total number marks on an assessment devoted to each category**. The relative weighting for all blueprinted categories must add up to 1.0.

$$\textbf{Relative Weighting} = \frac{Impact \times Frequency}{Sum of (Impact \times Frequency)}$$

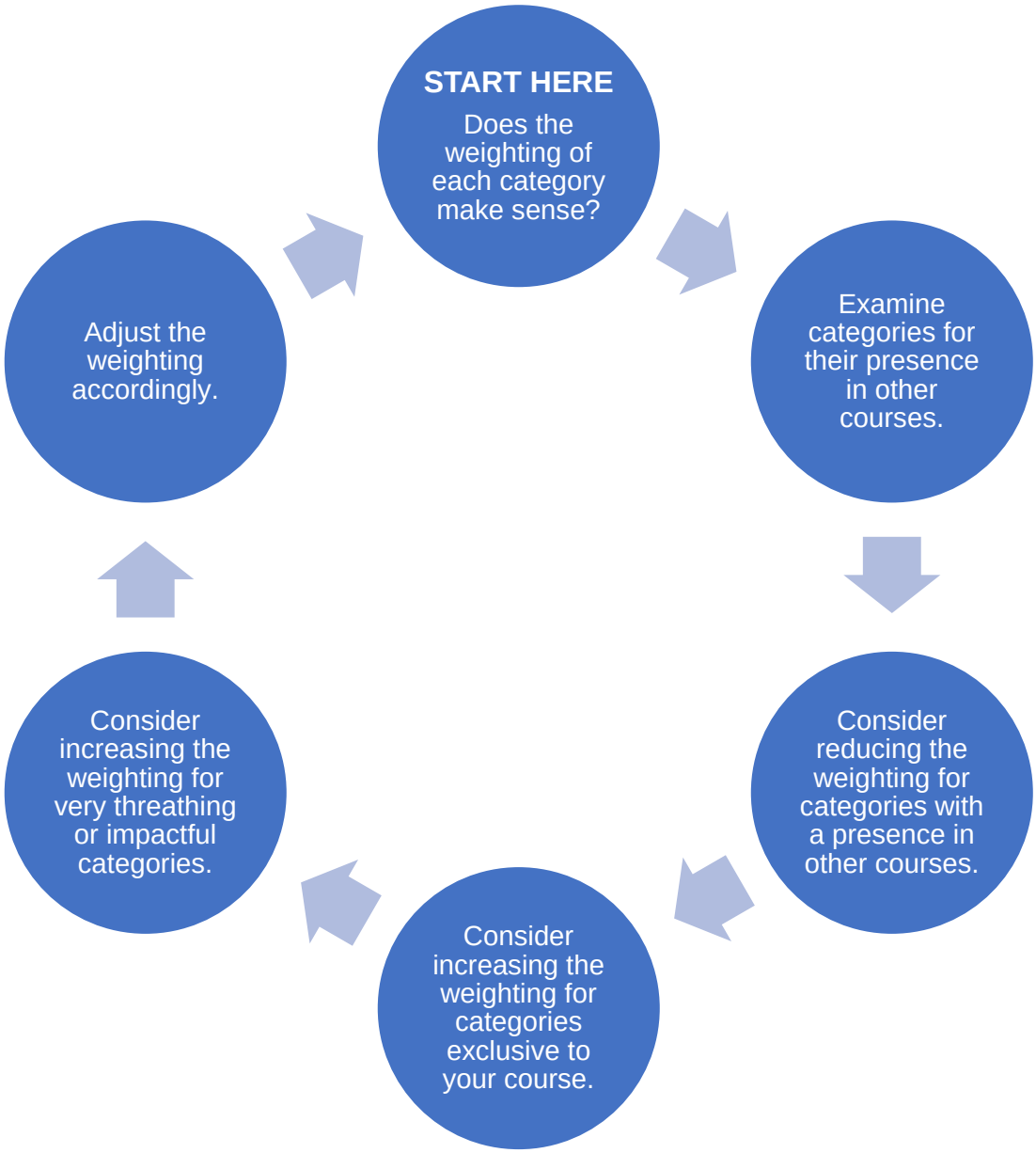
Example

	Impact (I)	Frequency (F)	I x F	Relative Weight (%)
Category A	1	3	3	12.0
Category B	2	2	4	16.0
Category C	3	2	6	24.0
Category D	3	3	9	36.0
Category E	3	1	3	12.0
Total			25	100

Category A: Impact = 1 Frequency = 3

Relative Weight of Category A = 1x3/(3+4+6+9+3) = 0.12

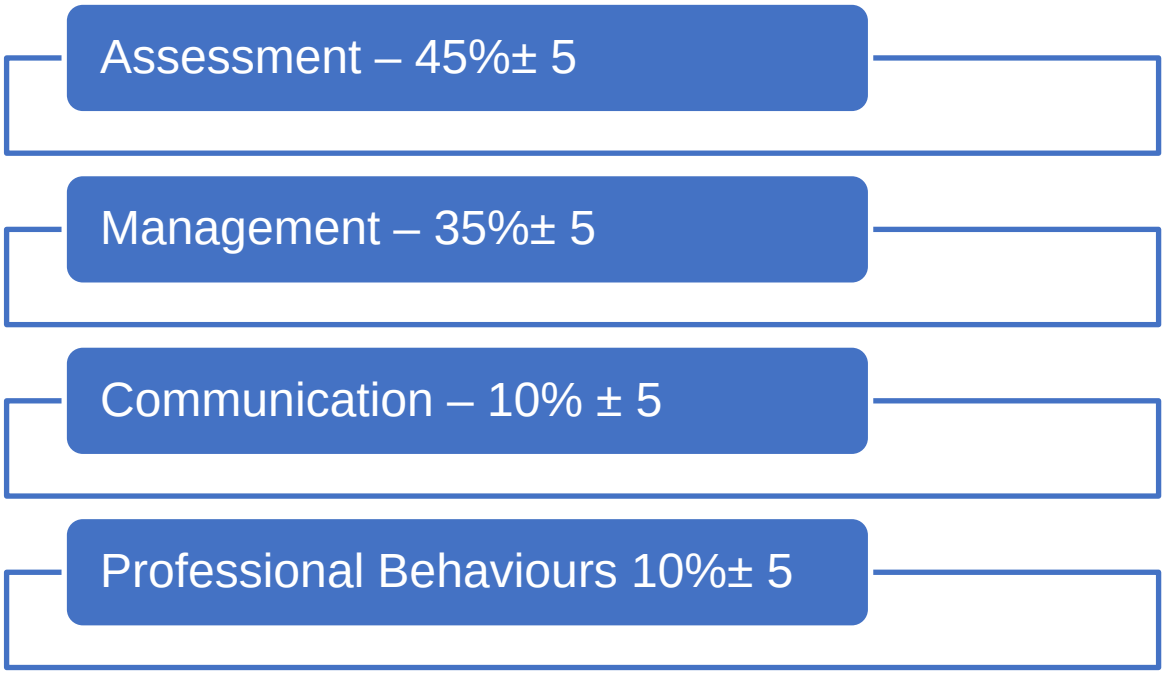
Step 7: Review the Weighting of Each Category



Step 8: Determine Test Specifications

i. Determine the test specifications for EACH of the components of your exam (e.g., written, and oral, if both exist).

ii. The MCC blueprints Physician Activities on the MCCQE Step 1 Examination as follows; aim for the same test specifications:



iii. If you have an **oral exam**, consider those categories with a high relative weight which you may wish to include there. Consider also the following:

- Oral exam scenarios are often worth a high proportion of marks on a mastery exercise
- Earmark categories with relatively high weight for an oral station and remove or significantly reduce the blueprints on the written assessment
- Oral exam scenarios may assess more than one blueprinted category if they are connected. e.g., depressive disorders + psychiatric emergency (suicide attempt)
- You may wish to add items to each oral station to include the less frequently assessed physician activities and dimensions of care such as Communicator, Professional Behaviours, Health Promotion/Illness Prevention, Chronic, etc.

iv. Next, consider the written assessment. Fill in the blueprint with existing questions/ content areas, starting with physician activities that are more challenging to test.

v. Ensure all Physician Activities and Dimensions of Care are tested.

vi. Consider MCC Constraints.

Step 9: Review Your Bank of Questions

Each question should reflect a **Content Area** PLUS a **Physician Activity** PLUS a **Dimension of Care**:

Physician Activities:

- Assessment/diagnosis
- Management
- Communication
- Professional activities

Dimensions of Care:

- Health promotion and illness behavior
- Acute
- Chronic
- Psychosocial aspects

i. Look at your existing questions to **understand how they fit into these categories**.

ii. Acknowledge major **gaps.**

   a. If you need to write questions, ask yourself which content areas lend themselves well to the more challenging areas. e.g., Consent and Capacity, Legal Responsibilities, etc.

   b. Consider constraints.

Step 10: Create an Assessment

Select/create questions based on blueprint. Review assessments to ensure that you are not missing Blueprinted Categories, Physician Activities, and/or Dimensions of Care.

Step 11: Review/Revise Course Learning Objectives to Match the Blueprint

Based on the created blueprinted, there may be learning objectives and curricular content that need to be revised or added. Think about Physician Activities, Dimensions of Care and Constraints.

Appendix - Psychiatry Clerkship Blueprint

Category	Weight (%)	Number of marks on ME/oral	*Physician Activities*			
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Delirium						
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Somatoform Disorders						
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Totals	100	60	21-30	18-24	3-9	3-9

**For reference, the next page list the diagnoses included in each blueprinted category.*

Physician Activities

Assessment/Diagnosis: History taking, Mental Status Examination, Investigations, Rating scales

Management: Medications and adverse effects, brain stimulation, psychotherapy, social interventions

Communication: Questioning technique, Counseling, De-escalation

Professional Behaviours: Mental Health Act, Consent and Capacity, Mandatory Reporting

Dimensions of Care

Consider questions from all the following Dimensions of Care: **Acute, Chronic, Health Promotion/Illness Prevention, Psychosocial Aspects**

Constraints

Consider questions with the following constraints: **Complexity, Age, Gender, Special populations** (marginalized populations, disabled, Indigenous, end of life etc.), **Settings** (rural, urban, LTC etc.)

Diagnoses Associated with Each Blueprinted Category

Depressive Disorders
- Major Depression
- Persistent Depressive Disorder
- Grief
- Adjustment Disorders
- Substance/Medical Conditions

Bipolar Disorders
- Bipolar 1
- Bipolar 2
- Cyclothymia
- Substance/Medical Conditions

Major Psychotic Disorders
- Schizophrenia
- Schizoaffective
- Schizophreniform
- Brief Psychotic
- Delusional Disorder
- Substance/Medical Conditions

Anxiety Disorders
- Generalized Anxiety
- Social Anxiety
- Panic Disorder
- Agoraphobia
- Specific Phobia
- Adjustment Disorders
- Substance/Medical Conditions

Trauma
- PTSD
- Acute Stress Disorder
- Substance/Medical Conditions

OCD and related
- OCD
- Hoarding
- Body Dysmorphic Disorder
- Trichotillomania/Excoriation
- Substance/Medical Conditions

Alcohol/Sedative Use
- Intoxication
- Withdrawal
- Disorder

Opioid Use
- Intoxication/overdose
- Withdrawal
- Disorder

Other substances
- Cannabis
- Stimulant/Cocaine
- Tobacco
- Hallucinogen
- Inhalant
- Gambling

Dementia
- Mild Neurocognitive Disorder
- Alzheimer's Dementia
- Vascular Dementia
- Lewy Body Dementia
- Frontotemporal Dementia
- Other Dementias

Delirium

Borderline/ASPD
- Borderline
- Antisocial

Other Personality Disorders
- General Personality Disorder
- Cluster A
- Other Cluster B
- Cluster C
- Defense mechanisms

Attention Deficit Hyperactivity Disorder

Disruptive Behaviour
- Conduct Disorder
- Oppositional Defiant Disorder
- Substance/Medical Conditions

Childhood Mood/Anxiety
- Adolescent Depression
- Childhood Bipolar Disorder
- Separation Anxiety
- Selective Mutism
- OCD
- Substance/Medical Conditions

Psychiatric Emergencies
- Suicide
- Violence/Agitation

Somatoform Disorders
- Somatic Symptom Disorders
- Illness Anxiety Disorder
- Conversion Disorder
- Factitious Disorder/Malingering

Eating Disorders
- Anorexia Nervosa
- Bulemia Nervosa
- Binge Eating Disorder