In preparation for the TBL, it is necessary to familiarize yourselves with key concepts of chronic disease management. To this end, the following resources have been compiled to help define important terms and better frame how the approach to chronic disease management relates to our health system overall. Please read the following supplemental guide and visit the suggested resources prior to coming to the TBL. It is recommended to view the pre-recorded lecture “Introduction to Ambulatory Care and the Chronic Care Model,” which reviews these concepts as well.

**Chronic vs. Acute Care**

**Epidemiology**

1. Chronic disease is responsible for 70% of deaths in the US
   a. CV disease and cancer account for almost half of deaths
2. Half of US adults have at least 1 chronic disease
3. A quarter of US adults have at least 2 chronic diseases
4. This phenomenon is largely due to a combination of prevalent, often preventable risk factors, an increase in life expectancy and social and environmental factors that adversely affect health.
5. The burden of chronic disease is unequally distributed (e.g. CVD highest among African Americans, obesity highest among low income and less educated, stroke deaths highest in the Southeast)

**Cost burden**

1. Care for chronic disease accounts for 84% of US Healthcare costs
2. “Waste” accounts for 30% of these costs: this includes fraud, administrative expenses, higher than value prices, and most of all “low value care”

What are some ways that care for chronic disease lends itself to wastefulness in healthcare spending?

**Different expectations**

Inherent qualities of chronic care make it its own unique challenge. Lack of immediate results or physically apparent outcomes require patients have to put a certain amount of trust in the provider. This is different from reducing a fracture, removing an appendix, treating an otitis media, etc. Providers also have to put their faith in treatments, recommendations, guidelines and surrogate markers. The burden of management is often shared between the provider and patient, which requires a change in perspective from physicians as well as patients. To effectively manage chronic disease, we need to dramatically shift our focus from reactive care to proactive care. Some physician and medical practice behaviors that contribute to poor care of chronic disease include rushed providers, failure to consult evidence based
When we treat patients with chronic disease, how are our goals different from the treatment of acute disease?

Recommended Resources:
1. CDC Website section on chronic care: http://www.cdc.gov/chronicdisease/

The Chronic Care Model
The Chronic Care Model is an evidence-based guideline designed to guide the transformation from reactive, acute-style chronic disease care to proactive, team based, high-quality chronic disease care. It was first proposed in the mid-1990s and has since been updated and validated by multiple studies focusing on multiple different chronic diseases, including diabetes and heart failure.

6 Components of the Chronic Care Model:
1. Health system - organization and support for all facets of the health care system; providing leadership for securing resources and removing barriers to care; includes support from the governing leadership and often reorganization of roles.
2. Self-management support - facilitating skills-based learning and patient empowerment, may include individual or group sessions with nurses or patient educators or routine telephone follow up; this goes beyond telling patients what to do and includes acknowledging their central role in the management of their disease and utilizing office and community resources to support this effort.
3. Decision support - providing guidance for implementing evidence-based care, providing training in EBM for primary care providers (PCP’s) and securing availability of specialist support by phone or email; integrating evidence-based guidelines into daily clinical care via EMR reminders, order sets, feedback, etc.
4. Delivery system design – defining roles and distributing tasks among team members; planning the office flow to accommodate proactive care (e.g. Diabetes days, nurse or educator availability timed appropriately with appointments, involving case management when needed) and structuring follow up care
5. Clinical information systems - tracking progress through reporting outcomes to patients and providers, creating and using disease registries, meaningful use of EMR, creating reminder systems; all of these actions
can identify patients and providers at risk of falling back into the rhythm of reactive care.

6. **Community resources and policies** - sustaining care by using community-based resources and public health policy; identify and promote community initiatives and organizations that fill gaps between needed services.\textsuperscript{vivii}

**Recommended Resources:**
1. Improving Chronic Illness Care Website: [http://improvingchroniccare.org/](http://improvingchroniccare.org/)

**Medical Complexity**

The presence of chronic disease creates a level of medical complexity that must be routinely acknowledged, documented and addressed, particularly when acute events take place. The concept of *homeostenosis* is important. It is a change in the body's ability to adapt to stress. As the body ages or physiologically ages with the accumulation of chronic disease, that ability decreases and the body becomes more susceptible to stress. It reaches its "physiological limit" more easily. We often find it easier to apply this concept to a particular organ or system, but it is equally or more important to apply it to the patient as a whole. Medical complexity affects the way a patient will respond to an illness, a medication, a surgery, a hospitalization, a trauma or even an emotional stress.

Examples of medical complexity altering the course of an acute illness include:

a) A patient with dementia and a UTI: In a young healthy patient, a UTI is likely to be either self-limiting or resolved with a short course of antibiotics with no loss of function, productivity or severe illness. In a patient with dementia, it is common to see delirium, sepsis, severe loss of function and prolonged hospitalization.

b) A patient with diabetes and viral gastroenteritis: A healthy patient with viral gastroenteritis can usually be treated as an outpatient with oral rehydration. A diabetic is more susceptible to severe dehydration and complications such as DKA, HHNK or dangerous hypoglycemia. One day of vomiting can often land a diabetic patient in the ICU.
A patient with chronic kidney disease and pneumonia: Pneumonia in a young healthy patient may cause some missed work, but can be treated as an outpatient with antibiotics. In a patient with chronic kidney disease, their immune function is compromised, making the pneumonia more likely to progress to life threatening severity. Their disease makes choice and dosing of antibiotics more delicate. They are far more likely to require hospitalization, have adverse drug reactions or to become septic.

***Consider some more examples of how patients with chronic disease must be viewed through a different lens in the setting of an acute process.***

**Multimorbidity**
The presence of multiple chronic conditions should be viewed as another crucial layer of medical complexity. As a person’s number of chronic diseases increases, their risk for premature death, hospitalization, functional impairment, adverse medication reactions, duplicative tests, and conflicting medical advice increases. Particularly in older adults, physicians may strictly follow a single disease guideline for a patient with multiple conditions, resulting in care that is irrelevant, impractical or even harmful. Care for these patients must be flexible, with communication between providers, close attention to details such as medication interactions and input from the patient and family as well as the healthcare team.

*Certain chronic diseases in combination present a more profound complexity than other combinations. Can you think of an example of two chronic diseases that have a particularly synergistic interaction?*

**Recommended Resources:**
1. The department of Health and Human Services has created a strategic framework for the approach to Multimorbidity, which can be viewed here: [http://www.hhs.gov/ash/initiatives/mcc/mcc_framework.pdf](http://www.hhs.gov/ash/initiatives/mcc/mcc_framework.pdf)
2. The American Geriatric Society has presented Guiding Principles, divided into 5 domains, for the Care of older adults with Multiple Chronic Conditions: [http://www.americangeriatrics.org/health_care_professionals/clinical_practice/clinical_guidelines_recommendations/](http://www.americangeriatrics.org/health_care_professionals/clinical_practice/clinical_guidelines_recommendations/) (listed as “AGS Guiding Principles for the Care of Older Adults with Multimorbidity”)

**Medications in Chronic Care:**
Medication non-adherence:
According to the WHO, among people with chronic illness, approximately 50% do not take their medications as prescribed. Non-adherence is a
complex behavior influenced by socioeconomic factors, disease-related factors, medication-related factors, provider-related factors and health system factors. The term “medication non-compliance,” has come to imply patient passivity. As physicians, we should not place blame on patients when medication regimens are not followed. This is simplistic and unproductive. Instead we share the responsibility of medication management, appreciate the complexity of medication prescribing and look to research and evidence to incorporate better prescribing habits into our practice.

Adverse Drug Events (ADE):

Medication Related Risk Factors:
The medications most likely to cause an adverse drug reaction leading to hospitalization are **anti-coagulants** (including aspirin, warfarin, NSAIDs, clopidogrel) followed by **anti-diabetic medications** (including insulin and oral hypoglycemics) and **opiates**. Other common offenders are beta-blockers, steroids, and diuretics. **Polypharmacy** (in the cited study, defined as 5 or more medications) is another strong medication-related risk factor for ADE. Medication errors are common in medication-related hospitalizations, the most common of all being lack of indication for the medication. Know why your patient is on the medications they are on!

Patient-related Risk Factors:
The most common patient-related risk factors for ADE’s are impaired cognition, 4 or more diseases (multimorbidity), dependent living situation, impaired renal function, and medication non-adherence. If your patient falls into one or more of these categories, a careful risk benefit analysis must take place.

Try to come up with a clinical intervention that is already in place or that you might put into place to address the issues of non-adherence and/or adverse drug events.

**Recommended Resources:**


**Endpoints: Surrogate vs. Clinical**

Trials are often designed to measure surrogate markers, endpoints or outcomes. These are intermediate markers intended to measure disease, whether it be severity, progress, prognosis, and treatment success or treatment failure. They are distinct from clinical outcomes. Some examples include LDL cholesterol, HgbA1C, FEV1, or even CD4 count. Surrogate
outcomes do not affect patients directly and may not be as highly valued by the patient as a clinical outcome such as stroke, MI, opportunistic infection or loss of function from diabetes complications. Surrogate endpoints sometimes prove to be less reliable than previously thought (e.g. HgbA1C is proving to be a racially variable, unreliable indicator of glycemia\textsuperscript{xv}). However, at times, they are the only methods we have to track disease. When used in accordance with guidelines, they must be explained to patients. Patients and physicians alike must recognize that patients do not experience or die from surrogate endpoints. Whenever possible, evidence we use in the care of chronic disease and multi-morbidity should center around “patient-important outcomes.”\textsuperscript{xvi} We must keep in mind that patient-important outcomes can vary between patients, particularly as patients near the end of life.

Consider an example of a patient choosing one outcome to be more important than another, and the way this may change their chronic disease management.

**Chronic Disease Prevention:**

Prevention Classification:

- **Primary Prevention (prevention):** an intervention intended to prevent a disease from occurring.
- **Secondary Prevention (detection):** an intervention that attempts to detect a disease early in order to modify the course of the illness.
- **Tertiary Prevention (mitigation):** an intervention imposed during the course of a disease in order to prevent or delay complications, disability of death from a disease.

*Most medical interventions fall into which of the above categories of preventative medicine?*

The CDC has identified 4 health risk behaviors as the largest contributors to modifiable risk for chronic disease.

1. Lack of exercise
2. Poor Nutrition
3. Excessive alcohol consumption
4. Tobacco use

**Recommended Resources:**

1. CDC Chronic Disease Prevention: [http://www.cdc.gov/chronicdisease/about/prevention.htm](http://www.cdc.gov/chronicdisease/about/prevention.htm)
High-Quality Evidence:

POEM’s (Patient Oriented Evidence that Matters):
When assessing an evidence source, usually a peer reviewed journal article, stop and ask yourself the following questions:
1. Is the evidence patient-oriented or disease-oriented?
2. Is the population studied relevant to the patient you are caring for?
3. Is the evidence relevant to your particular clinical question (i.e. does it matter)?

Are the following examples of good POEM use?
1. You are taking care of humans and you refer to an article about the efficacy of a drug on diseased rats.
2. You are a pediatrician and an article addresses the most common presentations of influenza in patients older than 65.
3. You take care of a patient with diabetes. The most common cause of death in diabetes is MI. Your patient asks how to best avoid MI and you cite an article about the ability of sulfonylureas to reduce Hemoglobin A1C.

Guideline Sources:
1. ChoosingWisely.org: This is a wonderful campaign that compiles recommendations from specialty societies designed to address and prevent wasteful medical care and to promote evidence-based medicine.
2. Specialty Societies: These are examples of the major academic societies that represent their specialty.
   a. Cardiology: American College of Cardiology/American Heart Association
   b. Lung Disease: American Thoracic Society
   c. Infectious Disease: Infectious Disease Society of America
   d. You get the idea...

Think about what specialty you may pursue and determine the corresponding specialty society and how to find their guidelines and recommendations.

3. Government Organizations
   a. USPSTF: http://www.uspreventiveservicestaskforce.org/ evidence-based guidelines for preventative services (e.g. cancer screening)
   b. Centers for Disease Control and Prevention: www.cdc.gov evidence based resource for patients and providers on a host of diseases and public health issues
   c. World Health Organization: http://www.who.int/about/en/ a health resource with a global scope addressing a wide array of diseases and initiatives
Number needed to treat & Number needed to harm:

When assessing whether an intervention is in the best interest of your patient, often the best way to answer that question is with NNT/NNH. NNT answers the question: how many people do I have to treat with this intervention in order to create one good outcome? NNH answers the question: how many people do I have to treat with this intervention in order to harm one patient? When applying joint decision making with your patients about things like cancer screening, this is a very helpful tool. Particularly with older patients, a timeframe when presenting NNT data is helpful (referred to as the time horizon benefit). Preventing one cervical cancer death over one year versus preventing one cancer death over 10 years may have a vastly different effect on decision-making. Another pertinent example is tight glycemic control. For tight glycemic control to confer a benefit, the time horizon benefit is likely between 5 and 7 years. When analyzed, tight glycemic control is more likely to do harm (via hypoglycemia) than good in elderly patients with multimorbidity who may have a limited life expectancy for reasons other than glycemic control.

Calculating the NNT requires you to know the absolute risk reduction: NNT = 1/ARR
Calculating the NNH requires you to know the attributable risk: NNH = 1/AR (No, we're not testing you on this, but USMLE will.)

Recommended Resources:
1. For review and practice with this, try www.cebm.org
2. www.thennt.com is a website that does the calculation for you and can be a great resource for you and your patients.

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ii “Preventing Chronic Disease: Eliminating the leading preventable causes of Premature Death and Disability in the United States,” A Prevention and Learning Unit prepared by the national Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention http://www.cdc.gov/chronicdisease/pdf/preventing-chronic-disease-508.pdf
iii Gawande, Atul, "Overkill; An Avalanche of unnecessary medical care is harming patients physically and financially. What can we do about it?" The New Yorker. 11
http://www.newyorker.com/magazine/2015/05/11/overkill-atul-gawande
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http://www.cdc.gov/chronicdisease/about/multiple-chronic.htm
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