Updates from the AMDA meeting

Clinical Update on Nursing Home Medicine: 2017

Barbara J. Messinger-Rapport MD, PhD, FACP, CMD, a Milta O. Little DO, CMD, b John E. Morley MB, BCh, b, a Julie K. Gammack MD, CMD b

a Section of Geriatric Medicine, Cleveland Clinic, Cleveland, OH
b Division of Geriatric Medicine, Saint Louis University School of Medicine, St. Louis, MO

Keywords:
Hypertension after SPRINT
COPD
breathlessness
cognitive impairment
dementia
wound care
pressure ulcers

A B S T R A C T

This is the 11th annual Clinical Update from the AMDA meeting article. This year the topics covered are hypertension after the Systolic Blood Pressure Intervention Trial; chronic obstructive pulmonary disease risk factors, diagnosis and management including end-of-life planning, and the difficulties with exacerbations such as breathlessness; diagnosis and treatment of cognitive impairment and dementia; and wound care and pressure ulcer management.

Hypertension After Systolic Blood Pressure Intervention Trial

Hypertension guidelines do not reflect the heterogeneity of the older population. A robust 80-year-old woman living in the community may play tennis and cycle daily, and have a life expectancy of more than 12 years.1 Another 80-year-old woman in the lowest quartile of fitness may require substantial care and have a life expectancy less than 5 years.2 The 2017 guideline published by the American College of Physicians and American Association of Family Physicians3 recommends a target systolic blood pressure (sBP) of 150 mm Hg, or 140 mm Hg if there is a history of a cerebrovascular event, in adults 60 years and over. There is no separate recommendation for frail elders, or specific recommendations for elders 80 years and over, regardless of frailty. Recommendations for adults 60 years and over by 8th Joint National Commission4 and Canadian Education Hypertension Program5 are similar. The European Europe6 and the Veterans Administration/Department of Defense7 guidelines offer statements of caution for the oldest and/or frailest individuals. Clarity regarding heterogeneity of the older population may soon be possible, since design of the recently published Systolic Blood Pressure Intervention Trial (SPRINT),7 incorporates at least some of the heterogeneity of the older adult population.

Current hypertension guidelines are driven by the major studies published over the past 3 decades preceding SPRINT. The large double-blind placebo-controlled legacy trials enrolled older adults with stage 2 hypertension (sBP >160 mm Hg) and targeted a systolic pressure of 140 mm Hg. Interestingly, the mean final blood pressure in the treatment arms of the 3 major trials Systolic Hypertension in the Elderly Program (SHEP),8 Systolic Hypertension in Europe trial,9 and Hypertension in the Very Elderly Trial,10 studies did not actually reach target. Nevertheless, the primary outcome of incident stroke was reduced 30%–42% among the trials. The incidences of secondary outcomes (heart failure and mortality) were also reduced in the SHEP and HYVET trials, which used diuretic antihypertensives. The Systolic Hypertension in Europe trial study,9 a calcium-channel blocker intervention, was terminated early on the basis of the primary outcome, so secondary outcome events may have been too few to determine their risks. A nonplacebo controlled trial of antihypertensives in older adults suggested a sBP nadir of 130 mm Hg for adverse cardiovascular outcomes.11 Based on that finding, the American College of Cardiology Foundation and the American Heart Association updated its 2011 guideline to recommend against lowering sBP and diastolic BP below 130 mm Hg and 65 mm Hg, respectively,12 for persons 80 years and over.

The SPRINT trial enrolled 9361 older participants with few comorbidities, but tracked important geriatric outcomes such as gait speed, cognition, and overall frailty. The research question was whether a target sBP of less than 120 mm Hg would have superior cardiovascular outcomes compared with the standard target sBP of less than 140 mm Hg. Major inclusion criteria were age 50 years and greater, sBP >160 mm Hg, and 1 or more of the following: cardiovascular disease, cardiovascular disease risk of at least 15%, chronic kidney disease with estimated glomerular filtration rate (eGFR) of 20–59 mL/min; or age of at least 75 years or greater. Major exclusion criteria were a past cerebrovascular event; diabetes; clinical heart failure or ejection fraction less than 35%; proteinuria greater than 1 g per 24 hours; eGFR 20 mL/min; dementia or nursing home residence without documented dementia; life expectancy of less than 3 years;
and standing sBP less than 110 mm Hg on entry to the study.13,14 The automated blood pressure cuff used in the SPRINT trial was the same as used in the Action to Control Cardiovascular Risk in Diabetes15 trial. Blood pressure in both trials was an average of 3 measurements taken 1 minute apart after a 5-minute rest.15 One important difference between SPRINT and every other large hypertension trial was that the automated blood pressures were unattended (ie, the clinician was outside the room). Therefore, blood pressures in this trial are likely to be 5–10 mm Hg lower than the typical community standard.16

The intense blood pressure target was tolerated well with this subject population; the withdrawal rate from the study was between 10% and 11% in both arms and was not different in the older subset. As with the legacy hypertension trials, the intense target sBP was not met. On the average, 3 antihypertensives were required to achieve a mean sBP of 121±6 mm Hg, and the control group required 2 antihypertensives to achieve a mean sBP of 134±6. The trial was discontinued early after a median follow-up of 3.3 years, because of a cumulative hazard ratio for cardiovascular events of 0.75 (95% CI 0.64–0.89), and a mortality hazard ratio of 0.73 (95% CI 0.60–0.90). This risk reduction translates to a number needed to treat (NNT) of 61 to prevent 1 cardiovascular event and 90 to prevent 1 death. Statistically significant serious adverse events included hypotension, syncope, electrolyte abnormalities, acute kidney injury or failure. Orthostatic hypotension in the treatment arm was statistically less than in the control arm. The most quoted adverse event was a drop in eGFR of at least 30% from a normal baseline occurred in 1.2% of the intense treatment arm, compared with 0.35% in the control treatment arm. Reversibility of the renal dysfunction is not known.

Exploratory analysis of the SPRINT senior cohort, the 28% of participants aged 75 years and over, reveals both risk and benefit in this age group.17,18 Electrolyte abnormalities occurred in 5% of the intensively treated group vs 3.6% of the control; acute kidney injury or failure occurred 5.9% vs 4.2%. Serum sodium less than 130 mmol/L was found in 5% vs 3.3%. Interestingly, the rate of injurious falls was lower in the intensive arm of the oldest adults (12%) compared with the standard treatment arm (14.6%), with P = .03.18,19 The NNT to prevent 1 cardiovascular event was 27 and to prevent 1 death 41. The smaller NNTs in the senior cohort compared with the overall trial reflect the increased absolute risk in this older population.

Despite recruiting among robust elders by design, deeper inspection of SPRINT senior participant characteristics reveals more heterogeneity than enrollment criteria suggest. Many subjects had impaired mobility, fitness, and cognition. For example, more than one-quarter of the older participants had a gait speed of less than 0.8 m/s and, thus, would be unable to cross a street in the time that it takes a quarter of the older participants had a gait speed of less than 0.8 m/s using a more typical technique. Elders with a wide range of cognitive and physical impairment translates to a systolic pressure closer to 130 mm Hg when measured with a Montreal Cognitive Assessment score of less than 26/30.21 One-quarter scored below 19, a cut-off with 77% specificity for mild dementia.22 Finally, almost one-third of the older participants were frail, based on a frailty index cutoff of 0.21.23

Secondary analysis of the senior cohort demonstrated that the most frail benefitted from the intensive BP control at least as well as the most fit. Treatment outcomes were similar in the slowest as well as the fastest walkers.19 The 3-year follow-up of the adults 75 years of age and over did not demonstrate any treatment differential on gait speed or mobility limitation.24 Secondary cognitive outcomes will be explored in the SPRINT Memory and Cognition in Decreased Hypertension (MIND) substudy.12

On the opposite end of the multimorbidity spectrum is the PARTAGE study,25 which looked at the relationship between sBP, antihypertensive use, and mortality in French and Italian nursing homes. A multivariate analysis examined mortality for those persons treated with antihypertensives. This subject population was on average 88 years old. Most had hypertension, and a substantial number had diabetes, heart disease, and heart failure. Mortality was higher in the more intensely controlled population, those participants with sBP less than 130 mm Hg and on at least 2 antihypertensives. The relationship held even when adjusted for age, sex, body mass index, and other characteristics.

More insight between blood pressure control and function follows a recent propensity study examining the relationship between post-myocardial infarction (MI) use of beta blockers and functional outcomes.26 This large database study queried Medicare Parts A and D, as well as MDS 2.0, in nursing home residents hospitalized with an acute MI between 2007 and 2010. Outcomes of interest were 90-day mortality and function. The study captured 10,992 older adults, with mean age 84 years. Approximately one-quarter had diabetes or chronic obstructive pulmonary disease (COPD); almost one-half had heart failure. Approximately 60% had mild to moderate dementia, and approximately one-third had moderate ADL impairment prior to hospitalization.27 Three months after the acute MI, one-quarter had been hospitalized again, 14% died, and 12% had a functional decline. Not unexpectedly, nursing home residents were less likely to die following an acute MI if they were discharged on a beta blocker. However, those elders with more cognitive and physical impairment prior to hospitalization were likely to be even more impaired if discharged on a beta blocker compared with similar patients not discharged on a beta blocker. This study fuels the need to have goals of care discussions with residents (or with their families) when significant functional impairment exists prior to an MI. In addition, there may be a benefit to deprescription when patients return from the hospital with beta blockers post-acute MI when function is more highly valued than longevity.

The 3 studies described here, the SPRINT, Predictive Values of Blood Pressure and Arterial Stiffness in Institutionalized Very Aged Population, and beta blockade post-MI, suggest hypertension treatment targets for those with minimal morbidities and for those with multiple morbidities. The Predictive Values of Blood Pressure and Arterial Stiffness in Institutionalized Very Aged Population study re-inforces current geriatric practice, as well as current guidelines, discouraging intense blood pressure control with 2 or more antihypertensives in a population with multiple morbidities. The beta-blocker study suggests a trade-off between survival and function in a functionally impaired, multimorbid population. On the other hand, SPRINT senior implies that robust elders benefit from and tolerate an intense target of 120 mm Hg, when measured as performed in the study, using the mean of serial measurements from a high quality automated cuff with the clinician outside the room. This target translates to a systolic pressure closer to 130 mm Hg when measured using a more typical technique. Elders with a wide range of cognitive skills and fitness, but without diabetes, heart failure, stroke, or dementia, may benefit from this intensive target. These patients must be willing and able to take, on average, 3 antihypertensives to achieve this target. Frequent reassessment of the risks and benefits would be needed to manage the hypertensive target. This approach is a novel view of hypertension treatment for very old persons, and differs substantially from current practice.

An important outcome that is not addressed by current published studies is frailty. The frailty phenotype was originally defined with the Framingham cardiovascular cohort.27,28 Higher cardiovascular risk scores predict development of prefraility and frailty.29 Would reducing future cardiovascular risk by treating hypertension to an intense target of 120 mm Hg reduce the risk of prefraility and frailty? The SPRINT MIND analysis may shed light on this subject, although the early termination of SPRINT may limit conclusions. The Intensive versus standard ambulatory blood pressure lowering to prevent functional Decline in the elderly study30 relates standard ambulatory blood pressure lowering to functional outcomes and white matter hyperintensities, which in turn are associated with frailty.31 This 3-year study has not yet been published, but might be one of the most exciting outcomes to antihypertension therapy.
Difficult Issues: COPD and Breathlessness

COPD is the progressive, chronic obstruction of lung airflow that interferes with normal breathing and is not fully reversible. Inclusive in the diagnosis are emphysema, chronic bronchitis, refractory (nonreversible) asthma, and some forms of bronchiectasis. It is characterized by increasing breathlessness over time and is diagnosed using spirometry.32

COPD had a global prevalence of 11.7% in 2010, with 384 million affected cases and >20% of those affected living in nursing homes. Depending on the year, it is the third or fourth leading cause of death in the United States and the world. There is an increasing prevalence with age (particularly in nonsmokers) but is not part of normal aging.33,34

The prevalence of COPD overall does not differ in the postacute and long-term care (PA-LTC) settings; however, there are some unique issues that patients with COPD face when living in these settings. First of all, there are high rates of cognitive and functional impairment, which impact whether medications and nonpharmacologic management techniques will be effective. There are also high rates of exacerbations possibly because of high rates of under-medication in PA-LTC. One study showed that 17% of residents with COPD (n = 21,000) received no medication, 60% were not prescribed long-acting bronchodilators or inhaled corticosteroids (ICS), and 20% had 2 or more exacerbations in 1 year.35 Lastly, nursing home air quality has been associated with respiratory outcomes. In homes with higher levels of pollutants, people with COPD report increased breathlessness, cough, and obstruction. This is most pronounced in age over 80 years and poorly ventilated homes.35

Risk Factors for and Diagnosis of COPD

There are several known risk factors for COPD, including genetic predisposition, recurrent lung infections, lower socioeconomic status, indoor and outdoor air pollution, occupational exposures, and increased body mass index.36 The biggest risk factors for COPD are smoking history (both personal and second-hand exposure) and age.

Aging is physiologically associated with an expected progressive decline in lung function, which when coupled with lung irritants (smoking, pollution, infection), is the main driver of COPD pathology. With age, dynamic lung volumes [vital capacity (VC), FVC, FEV1] decrease and static lung volumes (residual volume, functional residual capacity, and closing volume) increase, while total lung capacity remains unchanged. However, the major cause of age-related physiological changes in respiratory function is the loss of elastic recoil of the lung parenchyma. Progressive lung function deterioration in COPD reflects an amplification of the lung-aging physiologic process.36–38

The diagnosis of COPD is suspected in a person with symptoms of shortness of breath, cough, and increased sputum with an exposure to known risk factors, and confirmed with spirometry that shows a forced expiratory volume in 1 s/forced vital capacity (FEV1/FVC) ratio of < 0.70. COPD is further classified by severity using the postbronchodilator FEV1 according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria as follows: GOLD 1: mild, FEV1 > 80% predicted; GOLD 2: moderate, 50% < FEV1 < 80% predicted; GOLD 3: Severe, 30% < FEV1 <50% predicted; GOLD 4: very severe, FEV1 <30% predicted. Spirometry is often difficult to obtain in nursing home settings so the diagnosis is often made clinically. A clinical prediction tool has been validated in this setting by asking the following 3 questions of a resident with typical symptoms of COPD: (1) Does the resident have a greater than or equal to 19 pack-year smoking history? (2) Does the resident have shortness of breath at rest or on exertion? (3) Does the resident have a diagnosis of asthma? If the answer to any of these questions is yes, it is supportive of a diagnosis of COPD with a sensitivity 90.6%; specificity 77.8%.39,40

When evaluating for the presence of COPD in older adults, there are some diagnostic controversies to consider.33,38,40 First, it is questioned whether one ought to use the fixed FEV1 criteria vs the lower limits of normal. Most guidelines recommend using the measured postbronchodilator FEV1/FVC ratio at a fixed threshold value of less than 0.70. However, age-related physiologic decline in the FEV1/FVC ratio may lead to the overestimation of COPD prevalence, up to 23%. It has even been shown that 35% of healthy older adults over age 70 years and 50% of healthy adults over age 80 years who have never smoked have an FEV1/FVC ratio < 0.7.37 In the absence of symptoms or risk factors, it is not recommended to make a diagnosis of COPD in older adults only based on spirometry results. Instead, it has been suggested to use the lower limit of normal, which is defined as the age-corrected lower 55th percentile of the reference population.37,41

A second diagnostic quandary is separating pure COPD and asthma-COPD overlap syndrome (ACOS), which is the presence of airflow obstructive where aspects of both asthma and COPD are present, such as FEV1/FVC <0.70 and evidence of airflow reversibility.42 ACOS has 12%–55% prevalence among people with risk factors, signs, and symptoms of COPD. It is important to distinguish the 2 because the presence of ACOS changes the medication management algorithm as discussed later in this article. Lastly, it is very important to consider the co-existence of obstructive sleep apnea (OSA). Practitioners should be diligent to check for co-existing OSA when patient present with both obstructive air flow and pulmonary hypertension. Treatment of underlying OSA will significantly improve outcomes for patients.43

Comorbid Conditions in COPD

Coexisting and comorbid conditions are common and significantly affect outcomes in people with COPD. COPD has been associated with increased swallowing difficulties, which may lead to respiratory infections and malnourishment. In addition, the presence of comorbidity negatively affects drug management, functional capability, clinical outcomes, and disease severity. It is critical to understand that cognitive impairment is the main determinant of adherence so clinicians must assess cognitive status in all patients and alter educational and management strategies for those with both mild cognitive impairment and dementia. Patients with COPD will also exhibit reduced physical performance with comorbid anxiety, depression, osteoporosis, and obesity.40,44–48 Frailty is an important syndrome that also negatively impacts functional outcomes and survival so it is imperative to assess for frailty at regular intervals. The 6-Meter Walk Test is the standard frailty assessment for people with COPD in clinical trials and is easy to perform. Other physical measures can be used including the Short Physical Performance Battery or Berg Balance Scale, as well as well-validated scales, such as the FRAIL and SARC-F questionnaires (Figures 1 and 2). When frailty and sarcopenia are discovered, early and intensive rehabilitation is the best intervention to improve outcomes.41,51

It is very common in aging populations to encounter both COPD and heart disease in the same patient. Studies have shown that cardiovascular death is a leading cause of mortality (20-50%) in patients with COPD and a significant risk factor for recurrent hospitalization.52 There are 3 drug classes used for the management of coronary artery disease and cardiomyopathy that may impact outcomes of COPD. These are beta-blockers, HMG-CoA reductase inhibitors (or statins), and angiotensin-converting enzyme inhibitors.

Beta-blockers are used to reduce mortality in people with cardiovascular diseases, but prescribers are hesitant to use them for people with COPD because of the theoretical risk of bronchoconstriction and worsening dyspnea with the use of beta-blockade in chronic lung disease. However, recent evidence suggests that cardioselective beta-blockers are not only safe to use in people with COPD without an
The FRAIL Scale: A rapid, validated scale for the detection of frailty

3 or more positive answers – frail
1 or 2 positive answers – prefrail

Fatigue (have felt tired most or all of the time in past 4 weeks)
Resistance (have difficulty or unable to climb a flight of stairs)
Aerobic (have difficulty or unable to walk a block)
Illness (have more than 5 illnesses)
Loss of weight (have lost more than 5% of weight in past 6 months)


The mainstay of the management of COPD is done through pharmacologic treatment. When prescribing and overseeing medications in people with COPD, it is important to remember the following key points: (1) Age-related physiologic changes potentially decrease responsiveness to drugs and increase susceptibility to adverse drug reactions. (2) Knowledge of medication efficacy in PA-LTC and elderly populations is mostly extrapolated from data derived from younger or community-dwelling populations. (3) Overall, similar efficacy has been shown within drug classes so consideration should be made to use the cheapest and easiest to administer medications. (4) Drug delivery and number of required administrations per day are important considerations in the PA-LTC population. (5) Most of the people living in the LTC setting have significant frailty, disability, and cognitive impairment, which limit the use of inhalers with complicated propelling mechanisms. Similarly, complicated regimens increase the chance of administration errors when nurses and medication technicians have a large number of residents. Table 1 outlines some of the challenges and advantages of different inhaler types. Studies have shown that metered dose inhaler (MDI) efficacy is affected in people with impaired hand-breath coordination, fine motor control, hand or finger muscle strength, and cognition. One study found that a day after MDI training, 50% of people with mild cognitive impairment and 100% with dementia could not operate the device correctly. Dry powder inhalers (DPI) tend to be even more complex. Once the capsule is loaded, DPIs often require 8 additional steps, commonly associated with errors. However, 1 study showed that nursing home residents with mild to moderate dementia can be successfully educated on the proper use of DPI. Overall, meta-analyses of studies, that excluded people with cognitive impairment and neurologic deficits, comparing the clinical efficacy of the various delivery methods have failed to show a difference in outcomes. It is, therefore, important for prescribers to consider on an individual basis, based on care goals, the least complicated regimen that will maximize absorption and minimize adverse effects. While following treatment algorithms is useful, it is critical to understand that these are based on younger, more robust populations and may not be appropriate as sole management tools in the PA-LTC population. The various drug classes for treatment of COPD are briefly reviewed here.

COPD Management

The GOLD and AMDA—Society for Post-Acute and Long Term Care Medicine have created guidelines to assist the healthcare team in the management of COPD. Generally speaking, the management of COPD does not markedly differ for the elderly or PA-LTC patient. The overall goals of COPD management are to reduce mortality, hospitalizations, and lung function decline, prevent exacerbations, relieve dyspnea, improve exercise tolerance and health-related quality of life, and preserve functional independence. In the PA-LTC setting, it is important to follow a care process and individualized care plan, which is outlined in the AMDA clinical practice guideline on COPD management. There are 4 phases to a care process: recognition (identifying the presence of a risk or condition), assessment/root cause analysis (clarifying the nature and causes of a condition or situation and identifying its impact on the individual), treatment (selecting and providing appropriate interventions for that individual), and monitoring (reviewing the course of a condition or situation as the basis for deciding to continue, change, or stop interventions). The interprofessional team will use this care process to design the individual care plan, which may include the following: (1) Education of resident and family; (2) stop cigarette smoking and avoid aggravating factors; (3) reduce symptoms and complications associated with COPD; (4) maximize exercise tolerance; (5) reduce acute exacerbations; (6) prevent and treat any infections; (7) use evidence-based treatment options to optimize drug therapy; and (8) avoid or minimize therapy-related adverse events.

Integrated, interprofessional disease management of at least 3 months duration was shown to decrease hospital admissions and hospital days. It also improved disease-specific quality of life and exercise capacity, as measured by the 6-MWT.

Pharmacologic Management of COPD

The GOLD and AMDA—Society for Post-Acute and Long Term Care Medicine have created guidelines to assist the healthcare team in the management of COPD. Generally speaking, the management of COPD does not markedly differ for the elderly or PA-LTC patient. The overall goals of COPD management are to reduce mortality, hospitalizations, and lung function decline, prevent exacerbations, relieve dyspnea, improve exercise tolerance and health-related quality of life, and preserve functional independence. In the PA-LTC setting, it is important to follow a care process and individualized care plan, which is outlined in the AMDA clinical practice guideline on COPD management. There are 4 phases to a care process: recognition (identifying the presence of a risk or condition), assessment/root cause analysis (clarifying the nature and causes of a condition or situation and identifying its impact on the individual), treatment (selecting and providing appropriate interventions for that individual), and monitoring (reviewing the course of a condition or situation as the basis for deciding to continue, change, or stop interventions). The interprofessional team will use this care process to design the individual care plan, which may include the following: (1) Education of resident and family; (2) stop cigarette smoking and avoid aggravating factors; (3) reduce symptoms and complications associated with COPD; (4) maximize exercise tolerance; (5) reduce acute exacerbations; (6) prevent and treat any infections; (7) use evidence-based treatment options to optimize drug therapy; and (8) avoid or minimize therapy-related adverse events.

Integrated, interprofessional disease management of at least 3 months duration was shown to decrease hospital admissions and hospital days. It also improved disease-specific quality of life and exercise capacity, as measured by the 6-MWT.

Pharmacologic Management of COPD

The mainstay of the management of COPD is done through pharmacologic treatment. When prescribing and overseeing medications in people with COPD, it is important to remember the following key points: (1) Age-related physiologic changes potentially decrease responsiveness to drugs and increase susceptibility to adverse drug reactions. (2) Knowledge of medication efficacy in PA-LTC and elderly populations is mostly extrapolated from data derived from younger or community-dwelling populations. (3) Overall, similar efficacy has been shown within drug classes so consideration should be made to use the cheapest and easiest to administer medications. (4) Drug delivery and number of required administrations per day are important considerations in the PA-LTC population. (5) Most of the people living in the LTC setting have significant frailty, disability, and cognitive impairment, which limit the use of inhalers with complicated propelling mechanisms. Similarly, complicated regimens increase the chance of administration errors when nurses and medication technicians have a large number of residents. Table 1 outlines some of the challenges and advantages of different inhaler types. Studies have shown that metered dose inhaler (MDI) efficacy is affected in people with impaired hand-breath coordination, fine motor control, hand or finger muscle strength, and cognition. One study found that a day after MDI training, 50% of people with mild cognitive impairment and 100% with dementia could not operate the device correctly. Dry powder inhalers (DPI) tend to be even more complex. Once the capsule is loaded, DPIs often require 8 additional steps, commonly associated with errors. However, 1 study showed that nursing home residents with mild to moderate dementia can be successfully educated on the proper use of DPI. Overall, meta-analyses of studies, that excluded people with cognitive impairment and neurologic deficits, comparing the clinical efficacy of the various delivery methods have failed to show a difference in outcomes. It is, therefore, important for prescribers to consider on an individual basis, based on care goals, the least complicated regimen that will maximize absorption and minimize adverse effects. While following treatment algorithms is useful, it is critical to understand that these are based on younger, more robust populations and may not be appropriate as sole management tools in the PA-LTC population. The various drug classes for treatment of COPD are briefly reviewed here.

Short-Acting Bronchodilators

Short-acting bronchodilators are indicated to treat intermittent symptoms in all GOLD stages and are the main-stay of treatment for acute exacerbations. The nebulized form may also be indicated for symptoms in all GOLD stages and are the main-stay of treatment for acute exacerbations. The nebulized form may also be indicated for
improving FEV1, improving quality of life, decreasing dyspnea scores, and reducing rescue inhaler use. Studies also found no difference in efficacy between different LAMA so consideration should be made to use the most cost effective medication. The combination of tiotropium and long-acting beta-agonists (LABA) has been shown to significantly improve FEV1 and health-related quality of life and was more effective than doubling the dose of a single agent. Interestingly, exacerbations were reduced when a LAMA was added to a LABA but not when a LABA was added to a LAMA. There are some safety concerns with the use of LAMA, including potential anticholinergic effects such as dizziness, blurred vision, acute narrow angle glaucoma, and urinary retention. People with creatinine clearance <60 are as especially high risk of experiencing an adverse effect. Urinary retention is more likely to occur in the presence of other risk factors (severe benign prostatic hypertrophy, immobility, other anticholinergics) and early in the treatment course. There were also concerns that the different forms of tiotropium may place patients at higher risk of adverse cardiovascular events. Tiotropium Respimat uses a different kind of propellant that delivers the medication through a very slow-moving mist that is designed to help patients inhale the medicine easier so that the amount of medicine the patients take in does not depend on how fast they are able to inhale. Initial studies showed an increased risk of cardiac arrhythmias in the Respimat format vs the HandiHaler format but cumulative data have found no overall difference in safety and adverse outcomes between the 2 forms. These trials were not done specifically in PA-LTC or elderly populations but because the Respimat form is easier to inhale, it may be better for frail elderly and those living in LTC. One may consider avoiding it in people with baseline significant arrhythmias.

**Long-Acting Beta-Agonists**

The most commonly used long-acting beta-agonists (LABA) medications are salmeterol and formoterol (administered twice daily) and indacaterol (administered once daily). Indacaterol was found to

---

**Table: SARC-F Screen for Sarcopenia**

<table>
<thead>
<tr>
<th>Component</th>
<th>Question</th>
<th>Scoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength</td>
<td>How much difficulty do you have in lifting and carrying 10 pounds?</td>
<td>None = 0, Some = 1, A lot or unable = 2</td>
</tr>
<tr>
<td>Assistance in walking</td>
<td>How much difficulty do you have in walking across a room?</td>
<td>None = 0, Some = 1, A lot, use aids, or unable = 2</td>
</tr>
<tr>
<td>Rise from a chair</td>
<td>How much difficulty do you have in transferring from a chair or bed?</td>
<td>None = 0, Some = 1, A lot or unable without help = 2</td>
</tr>
<tr>
<td>Climb stairs</td>
<td>How much difficulty do you have in climbing a flight of ten stairs?</td>
<td>None = 0, Some = 1, A lot or unable = 2</td>
</tr>
<tr>
<td>Falls</td>
<td>How many times have you fallen in the last year?</td>
<td>None = 0, 1-3 falls = 1, 4 or more falls = 2</td>
</tr>
</tbody>
</table>

_Fig. 2. SARC-F Screen for Sarcopenia. *SARC-F scale scores range from 0 to 10 (ie, 0–2 points for each item; 0 = best to 10 = worst) and represent no sarcopenia (0–3) and sarcopenia (4–10)._
Adverse events. People with COPD on ICS have a higher risk of pneumonias. In addition, this medication has not been studied in a PA-LTC population because there is a decreased physiological response to theophylline with aging; it has not been well studied in older adults; and it has a narrow therapeutic window with high drug-drug/disease interactions. In other words, to achieve a therapeutic benefit in older adults, theophylline would need to be titrated to a dose that would cause toxic reactions.36,41,67

ICS

ICS are indicated for people with COPD who experience frequent exacerbations. In that group, it has been shown to reduce exacerbations and decline in health status and improve health-related quality of life scores. As with other drug classes, there appears to be no difference in daily vs twice daily dosing so consideration should be made to use the cheapest and/or easiest to administer.36,65,66 There is also some evidence that starting a LABA/ICS combination in drug-naïve patients older than 65 years with an asthma component (ACOS) decreases death and hospitalizations.37,41 ACOS is the only time one would consider an ICS for first-line therapy. For people with pure COPD (with no overlapping asthmatic component), ICS are reserved for more severe, refractory disease because of the potential associated adverse events. People with COPD on ICS have a higher risk of pneumonia and pneumonia-related mortality.36,37,65 In addition, ICS have been associated with decreased bone mineral density, increased fractures, cataracts, oral candidiasis, and drug-drug interactions since ICS are metabolized by CYP3A4 enzymes.

Other Therapies

Roflumilast is a phosphodiesterase (PDE-4) inhibitor that has been shown to significantly improve post and pre FEV-1, breathlessness/dyspnea, and exacerbations. However, this medication is associated with significantly higher adverse effects, including diarrhea, nausea, headaches, weight loss, nasopharyngitis, and upper respiratory infections. In addition, this medication has not been studied in a PA-LTC population and studies include patient with only a mean age of 62–68 years.36,41,67–70 Careful consideration of the risks and benefits of this medication should be taken before starting in PA-LTC and older populations.

Theophylline is also a PDE-4 inhibitor but is not recommended for the PA-LTC population because there is a decreased physiological response to theophylline with aging; it has not been well studied in older adults; and it has a narrow therapeutic window with high drug-drug/disease interactions. In other words, to achieve a therapeutic benefit in older adults, theophylline would need to be titrated to a dose that would cause toxic reactions.36,41,67–70

The routine use of macrolide antibiotics in advanced COPD has been studied and shown to decrease exacerbations and improve quality of life. Unfortunately, these benefits come at the cost of an increased risk of antibiotic resistance. Therefore, it is not recommended to routinely prescribe macrolide antibiotics for the treatment of patients with COPD and this practice is currently limited to research studies.36,41,67–70

Oxygen has been associated with a 50% mortality reduction and is indicated when the patient’s PaO2 is less than 55 mm Hg or SaO2 is less than 90%. There is no reported benefit if the PaO2 is above 60 mm Hg. Continuous oxygen therapy is associated with better outcomes than with nocturnal use only.41,49

Nonpharmacologic Interventions in COPD

Pulmonary rehabilitation is the mainstay of treatment to be used alongside medication management and has been incorporated into all major COPD treatment guidelines. Pulmonary rehabilitation is a highly effective and safe intervention that has been consistently shown to reduce hospital admissions and mortality, and improve functional capacity, dyspnea and health-related quality of life.51,71–75 Rehabilitation protocols should include endurance and resistance training. Unfortunately, rehabilitation programs are often limited in availability. In addition, studies often excluded people with severe COPD and functional limitations and only studied young and outpatient populations.

There is limited data on the impact of pulmonary rehabilitation in the PA-LTC setting but a couple of recent studies suggest that there is positive impact of incorporating a pulmonary rehabilitation program into the care plan of this population. The Geriatric-COPD (GR-COPD) research group created an individually tailored rehabilitation program with a palliative care component. There were 12 interprofessional modules that covered (1) optimizing pulmonary medication use and inhalation techniques; (2) Chronic use of oxygen; (3) smoking cessation; (4) control of symptoms; (5) physiotherapy (endurance and strength training, inspiratory muscle training, relaxation techniques, breathing regulation skills and mucus evacuation techniques); (6) occupational therapy (regulation of pace, use of walking aids); (7) nutritional status and dietary supplementation; (8) speech, breathing, and swallowing techniques; (9) Psychosocial management; (10) self-management strategies and peer support contact; (11) spiritual needs; and (12) advance care planning. People with COPD were placed into 2 different groups. The GR-COPD 1 group was comprised of patients with a stable disease course whose goals were to regain pre-hospitalization functional status. For this group, the programmatic focus was exercise, medication optimization, nutritional advice, and patient education. The GR-COPD2 group included patients with frequent exacerbations and hospitalizations, multiple comorbidities, and functional decline or dependency. For this group, the focus was on quality of life and palliation with attempts to slow functional decline. For both groups, this postacute program showed a significant and clinically meaningful improvement in functional capacity and health status.75

Another study of pulmonary rehabilitation in PA-LTC offered an individualized protocol of 24 sessions over a 6-8 week sessions. The description of the protocol was not different than what is typically offered in the United States postacute setting except that this group

---

Table 1

<table>
<thead>
<tr>
<th>Challenges and Advantages of Inhaler Types</th>
<th>Pressurized MDIs</th>
<th>Dry Powder Inhalers</th>
<th>Nebulizers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Challenges</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>“The most complex dosage form in medicine”</td>
<td>“The most complex dosage form in medicine”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spacers +/−</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Optimizing use</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use breath-actuated MDI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>if strength limitation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Other Therapies</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Roflumilast is a phosphodiesterase (PDE-4) inhibitor that has been shown to significantly improve post and pre FEV-1, breathlessness/dyspnea, and exacerbations. However, this medication is associated with significantly higher adverse effects, including diarrhea, nausea, headaches, weight loss, nasopharyngitis, and upper respiratory infections. In addition, this medication has not been studied in a PA-LTC population and studies include patient with only a mean age of 62–68 years.36,41,67–70 Careful consideration of the risks and benefits of this medication should be taken before starting in PA-LTC and older populations. Theophylline is also a PDE-4 inhibitor but is not recommended for the PA-LTC population because there is a decreased physiological response to theophylline with aging; it has not been well studied in older adults; and it has a narrow therapeutic window with high drug-drug/disease interactions. In other words, to achieve a therapeutic benefit in older adults, theophylline would need to be titrated to a dose that would cause toxic reactions.36,41,67–70
| **Nonpharmacologic Interventions in COPD** |                 |                   |            |
| Pulmonary rehabilitation is the mainstay of treatment to be used alongside medication management and has been incorporated into all major COPD treatment guidelines. Pulmonary rehabilitation is a highly effective and safe intervention that has been consistently shown to reduce hospital admissions and mortality, and improve functional capacity, dyspnea and health-related quality of life.51,71–75 Rehabilitation protocols should include endurance and resistance training. Unfortunately, rehabilitation programs are often limited in availability. In addition, studies often excluded people with severe COPD and functional limitations and only studied young and outpatient populations. There is limited data on the impact of pulmonary rehabilitation in the PA-LTC setting but a couple of recent studies suggest that there is positive impact of incorporating a pulmonary rehabilitation program into the care plan of this population. The Geriatric-COPD (GR-COPD) research group created an individually tailored rehabilitation program with a palliative care component. There were 12 interprofessional modules that covered (1) optimizing pulmonary medication use and inhalation techniques; (2) Chronic use of oxygen; (3) smoking cessation; (4) control of symptoms; (5) physiotherapy (endurance and strength training, inspiratory muscle training, relaxation techniques, breathing regulation skills and mucus evacuation techniques); (6) occupational therapy (regulation of pace, use of walking aids); (7) nutritional status and dietary supplementation; (8) speech, breathing, and swallowing techniques; (9) Psychosocial management; (10) self-management strategies and peer support contact; (11) spiritual needs; and (12) advance care planning. People with COPD were placed into 2 different groups. The GR-COPD 1 group was comprised of patients with a stable disease course whose goals were to regain pre-hospitalization functional status. For this group, the programmatic focus was exercise, medication optimization, nutritional advice, and patient education. The GR-COPD2 group included patients with frequent exacerbations and hospitalizations, multiple comorbidities, and functional decline or dependency. For this group, the focus was on quality of life and palliation with attempts to slow functional decline. For both groups, this postacute program showed a significant and clinically meaningful improvement in functional capacity and health status.75
| **Another study of pulmonary rehabilitation in PA-LTC offered an individualized protocol of 24 sessions over a 6-8 week sessions. The description of the protocol was not different than what is typically offered in the United States postacute setting except that this group** |                 |                   |            |
had 3-hour sessions (longer than the typical skilled nursing facility session) 3–4 days a week (less frequent than in the typical skilled nursing facility). This is a small study (23 patients in 1 postacute facility) with no placebo group so should be seen as a preliminary and hypothesis-driving study. That being said, the researchers found improved 6-MWT and improved quality of life scores. Patients under age 65 years also benefited from improved dyspnea scores.76

Other important nonpharmacologic treatments for COPD include the following:49 (1) smoking cessation, which reduces mortality and cardiovascular risk; (2) influenza vaccination, which reduces exacerbations, hospitalizations, and mortality; (3) patient education, which reduces exacerbations and healthcare utilization; (4) nutritional supplements, which when combined with exercise can improve health-related quality of life, exercise capacity, and weight loss; (5) noninvasive ventilation (CPAP and BiPAP), which for selected patients may improve quality of life and reduce mortality; and (6) lung reductions surgery, which has very limited evidence of efficacy in older adults.

End-of-Life Care Planning

COPD is a progressive inflammatory disease with a decline trajectory that is marked by functional decline following an exacerbation with return to slightly below pre-exacerbation baseline. Therefore, it is very difficult to accurately prognosticate. Some clinical features that are more likely to be associated with end-stage (6-months or less to live) COPD are disabling shortness of breath at rest, progressive respiratory decline, increased emergency room visits or hospitalizations, low oxygenation at rest (PaO2 < 55 mm Hg or SaO2 < 88%), progressive weight loss greater than 10% in last 6 months, and resting heart rate greater than 100 beats/minute.54 Even when these features are present, 50% of patients will live beyond the expected 6 months. Despite this, patients may benefit from a comprehensive interprofessional palliative care team for symptom management and advanced care planning.77,78

Treatment of breathlessness in advanced disease is challenging. Opioids can help to reduce air hunger and are particularly useful in the very terminal stages of COPD. Systemic anticholinergics or antimuscarinics are also used frequently to reduce excessive secretions

Treatment of Exacerbations

Practitioners in PA-LTC must be comfortable with the management of COPD exacerbations. Early identification and treatment of COPD exacerbations may help to avoid emergency room visits and hospitalizations. Identification of exacerbations may be more challenging because of atypical presentations in the elderly and PA-LTC populations, including dizziness, extreme weakness, chest pain, and confusion. Once an exacerbation has been identified, the mainstay of treatment are short-acting β2-agonists and systemic steroids, which shorten recovery time, improve lung function (FEV1) and arterial hypoxemia (PaO2), and reduce the risk of early relapse or treatment failure.50 Antibiotics stewardship is important and antibiotics are not needed for all exacerbations. People who would most likely benefit from antibiotic treatment for an acute COPE exacerbation exhibit increasing dyspnea despite initial treatments with short-acting β2-agonists and systemic steroids, increasing sputum volume, and purulence.

**Figure 3** is a pyramid of treatment that helps guide treatment for practitioners.41

**Treatment of Exacerbations**

Practitioners in PA-LTC must be comfortable with the management of COPD exacerbations. Early identification and treatment of COPD exacerbations may help to avoid emergency room visits and hospitalizations. Identification of exacerbations may be more challenging because of atypical presentations in the elderly and PA-LTC populations, including dizziness, extreme weakness, chest pain, and confusion. Once an exacerbation has been identified, the mainstay of treatment are short-acting β2-agonists and systemic steroids, which shorten recovery time, improve lung function (FEV1) and arterial hypoxemia (PaO2), and reduce the risk of early relapse or treatment failure.

**Figure 3** is a pyramid of treatment that helps guide treatment for practitioners.41

**Treatment of Exacerbations**

Practitioners in PA-LTC must be comfortable with the management of COPD exacerbations. Early identification and treatment of COPD exacerbations may help to avoid emergency room visits and hospitalizations. Identification of exacerbations may be more challenging because of atypical presentations in the elderly and PA-LTC populations, including dizziness, extreme weakness, chest pain, and confusion. Once an exacerbation has been identified, the mainstay of treatment are short-acting β2-agonists and systemic steroids, which shorten recovery time, improve lung function (FEV1) and arterial hypoxemia (PaO2), and reduce the risk of early relapse or treatment failure.50 Antibiotics stewardship is important and antibiotics are not needed for all exacerbations. People who would most likely benefit from antibiotic treatment for an acute COPE exacerbation exhibit increasing dyspnea despite initial treatments with short-acting β2-agonists and systemic steroids, increasing sputum volume, and purulence.

**End-of-Life Care Planning**

COPD is a progressive inflammatory disease with a decline trajectory that is marked by functional decline following an exacerbation with return to slightly below pre-exacerbation baseline. Therefore, it is very difficult to accurately prognosticate. Some clinical features that are more likely to be associated with end-stage (6-months or less to live) COPD are disabling shortness of breath at rest, progressive respiratory decline, increased emergency room visits or hospitalizations, low oxygenation at rest (PaO2 < 55 mm Hg or SaO2 < 88%), progressive weight loss greater than 10% in last 6 months, and resting heart rate greater than 100 beats/minute.54 Even when these features are present, 50% of patients will live beyond the expected 6 months. Despite this, patients may benefit from a comprehensive interprofessional palliative care team for symptom management and advanced care planning.77,78

**Treatment of breathlessness in advanced disease is challenging. Opioids can help to reduce air hunger and are particularly useful in the very terminal stages of COPD. Systemic anticholinergics or antimuscarinics are also used frequently to reduce excessive secretions**

**Figure 3.** The COPD pyramid of treatment. Adapted from the Canadian Thoracic Society and GOLD guidelines. Azith, azithromycin; LTS, lungs transplant surgery; LVRS, lungs volume reduction surgery including endobronchial approaches; OCS, oral corticosteroids; Roflum, roflumilast; Theo, theophylline; SABA, short-acting β2-agonist; SAMA, short-acting muscarinic antagonist; Vaccinations, annual influenza, pneumococcal, and pertussis vaccinations.
Healthcare professionals need to be able to recognize whether or not cognitive impairment should be done on all persons over 65 years as well as throughout the disease course. Non-pharmacologic treatments, including pulmonary rehabilitation, are evidenced-based and beneficial for all patients, regardless of functional status or disease stage. Pharmacologic treatment starts with LAMA with the addition of LABA for more moderate or severe disease. ICS are reserved for patient with frequent exacerbations or ACOS. Patients should be prescribed the cheapest and easiest to use inhalers, remembering that MDIs are the most difficult for people with functional or cognitive impairments. Nebulizers may be used for maintenance therapy in the presence of cognitive and functional loss. Practitioners should continually evaluate for and manage frailty, OSA, depression, and other co-morbid conditions to improve patient outcomes. Advanced care planning should begin at the early stages of disease and continue throughout the disease course.

Cognitive Impairment

“Memory is a passion no less powerful or pervasive than love”
~Elie Wiesel

All Rivers Run to the Sea

Cognitive impairment was one of the major areas identified by the JAMDA article titled, International Survey of Nursing Home Research Priorities. The International Association of Gerontology and Geriatrics Brain Health consensus conference felt that case finding for cognitive impairment should be done on all persons over 65 years as healthcare professionals need to be able to recognize whether or not patients can follow instructions. In addition, treatable causes of cognitive decline need to be treated early, and lifestyle intervention such as a Mediterranean diet with extra virgin olive oil and exercise can slow the rate of cognitive decline. Finally, early diagnosis allows the development of advance directives.

Between 2000 and 2012, dementia has decreased from 11.6% to 8.8% in the USA. Cognitive impairment with no dementia declined from 21.2% to 18.8%. This is most probably because of aggressive preventive therapies for cardiovascular disease (hypertension and hyperlipidemia) in middle-aged persons. This highlights the role of vascular dementia as a major cause of cognitive decline. Based on postmortem studies done by the Seattle-based Adult Changes in Thought study, 33% of persons dying with dementia have vascular based lesions, with 45% having Alzheimer disease and 10% Lewy-body dementia.

Overproduction of amyloid precursor protein leads to decreased memory by inhibiting the release of acetylcholine and other neurotransmitters, phosphorylating TAU, activating mitochondria to produce apoptosis and oxidative damage, and creating amyloid plaques. It is important to recognize that persons with normal cognition can have amyloid-beta plaques. While pharmacologic doses of beta-amyloid given into the hippocampus of mice causes memory impairment, low doses of beta-amyloid enhance memory and acetylcholine release from the hippocampus.

Table 2 lists the common dementia in older persons. It is important to recognize that persons with diabetes mellitus, in whom cognitive impairment is common from the age of 50 years, is not due to Alzheimer disease. Metformin may reduce the incidence of cognitive dysfunction in persons with diabetes. Table 3 lists the common causes of reversible dementias.

Persons with moderate dementia respond to Cognitive Stimulation Therapy, or SAIDO in Japan, at least as well as to drugs. This has also been shown in the nursing home. Similarly reminiscence therapy may improve memory as seen with sports based reminiscence therapy (eg, soccer or baseball).

Families and physicians have problems recognizing dementia. Documented unsafe behaviors in persons with dementia where the healthcare physician failed to make the diagnosis include self-medication management (49%), driving (23%), handling finances (29%), and visiting the doctor alone (28%). Based on recent studies, cognitive decline in early stages is best recognized by the Montreal Cognitive Assessment or the St. Louis University Mental Status (SLUMS) examination. The Rapid Cognitive Screen is derived from the SLUMS and takes under 3 minutes to administer. It functions better than the Mini-Cog or Mini-Mental State Examination. Our group has shown that early recognition of mild cognitive impairment can lead to 48% of these patients being normal at 6 years when provided appropriate management by geriatricians.

Recent evidence has suggested that persons with mild cognitive impairment who also have frailty have particularly poor outcomes. The FRAIL scale represents a rapid, well-validated test for frailty. Both the Rapid Cognitive Screen and the FRAIL are included as part of the Rapid Geriatric Assessment. It is clear that the diagnosis and management of dementia is extremely complicated and that appropriate management can slow or reverse its course. This is a clear example where computer assisted patient centered approach (P4 medicine) will be the appropriate paradigm.

Update on Wound Care

Wound Care Societies

In the past 10 years, the emphasis on a standardized and scientific approach to chronic wound care has greatly increased. Several organizations are leading this charge through education, advocacy, and the development of practice guidelines to set more rigorous standards of clinical practice. In many cases, these organizations sponsor reputable peer-reviewed journals dedicated to wound management. Governmental agencies are taking note of these efforts and establishing guidelines for wound care.

Table 2

<table>
<thead>
<tr>
<th>Common Causes of Dementia in Older Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Primary age-related tauopathy (PART)</td>
</tr>
<tr>
<td>2. Hippocampal sclerosis of aging</td>
</tr>
<tr>
<td>3. Vascular dementia</td>
</tr>
<tr>
<td>4. Lewy body dementia</td>
</tr>
<tr>
<td>5. Dementia of diabetes mellitus</td>
</tr>
<tr>
<td>6. Frontotemporal dementia (Pick disease)</td>
</tr>
<tr>
<td>7. Hyperamyloidosis of the brain (Alzheimer disease)</td>
</tr>
</tbody>
</table>
The Association for the Advancement of Wound Care is a national leader in the field of chronic wound care. This nonprofit organization, established in 1995, offers many educational resources and maintains a Guideline Task Force that reviews and publishes practice guidelines for the US Department of Health and Human Services Agency for Healthcare Research and Quality. The most recent Venous Ulcer and Pressure Ulcer guidelines were produced in 2010.138 Association for the Advancement of Wound Care supports the journal Ostomy Wound Management. The National Pressure Ulcer Advisory Panel is another national not-for-profit organization with international collaborations (European Pressure Ulcer Advisory Panel, Pan Pacific Pressure Injury Alliance) that has developed many guidelines and resources for wound care. Most well-known include the Pressure Ulcer Scale for Healing tool and the 2014 Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline, which includes 575 recommendations. Most recently, an updated International Pressure Ulcer Guideline was published in 2016, with revised staging terminology of “pressure injury” and the categorization of “deep tissue injury.”139

The Wound Healing Society is a nonprofit scientific organization focused on both acute and chronic wound healing. This organization supports the journals of Wound Repair and Regeneration and Advances in Wound Care. This society has published updated guidelines for diabetic foot ulcer, arterial ulcers, pressure ulcers, and venous ulcers.140

Educational certification in wound care is possible through several organizations and for different medical providers.141 Certification courses are of varying length and cost, with some requiring continuing education for maintenance of certification. AMDA, The Society for Post-Acute and Long-Term Care Medicine, also offers educational materials in chronic wound care. An updated Pressure Ulcer and Other Wounds Clinical Practice Guideline was just released in 2017 and a Clinical Practice Guideline for Nursing Assistants CD-ROM and slide set includes material on pressure ulcers as well as other chronic medical conditions.142

Wound Biofilm

In the last few years the discussion of biofilm in chronic wound care has become increasingly common. Biofilms are bacterial aggregates within a biopolymer matrix that are resistant to antimicrobial treatment and may impede wound healing. Biofilms are difficult to remove, and it is postulated that debridement of biofilm will improve healing in wounds that have failed to improve with traditional topical treatments. Unfortunately, there is lack of consistent data on the diagnostic criteria for biofilms, how to test for biofilm presence, and the best type of treatment (duration and frequency) to remove the biofilm. As many studies assess wounds of mixed etiology, size, and comorbidities and are of small sample size, the quality of scientific data is often limited.

A recent consensus panel of experts was convened to develop recommendations for the management of biofilms but identified no clinical, therapeutic, or diagnostic randomized controlled trials to inform the consensus document.143 Using basic science evidence, this panel deemed “investigation for presence of biofilm” a “strongly relevant” recommendation for diabetic foot ulcers and dehisced surgical wounds. The panel strongly recommended mechanical debridement for pressure ulcers, venous ulcers, and diabetic foot ulcers when biofilm presence was suspected. Adjunctive use of antimicrobial dressings and topical antiseptics were strongly recommended in arterial, pressure, and diabetic foot ulcers but not venous stasis ulcers.

Another consensus panel, from the European Society for Clinical Microbiology and Infectious Diseases, had a more reserved view in stating that,

“There is no evidence to support the use of systemic antimicrobial agents to prevent biofilm infections in the treatment of wound-associated infections. While the rationale for debridement seems logical, the evidence to support its use to enhance healing is scarce. There is more evidence in the literature on the effectiveness of debridement for diabetic foot ulcers than for venous ulcers and pressure ulcers. After debridement, topical antimicrobial agents may be more effective in the treatment of the infected wound and in avoiding the re-establishing of microbial biofilm.”144

Although debridement of biofilm is recommended, the evidence is limited. A small but well-designed randomized controlled study of 14 chronic wounds with biofilm was recently published. Use of sharp versus hydrodebridement of chronic wounds failed to demonstrate significant reduction in bacterial tissue load after the intervention, or a difference in bacterial reduction between the 2 debridement methods.145

Debridement for removal of slough or necrotic tissue (not biofilm) has a more established clinical evidence base. A study of 48 diabetic foot ulcers randomized to sharp vs enzymatic debridement showed greater improvement in wound healing in the enzymatic group. Enzymatic debridement was more cost effective, as the sharp debridement required multiple visits to a wound care center in contrast to home administration of the enzymatic product.146 Other authors failed to find difference in wound size reduction or closure rates for diabetic foot ulcers (N = 215) randomized to enzymatic debridement versus topical hydrogel.147 A systematic review of debridement methods for diabetic foot ulcer also failed to endorse one method of wound debridement over another.148

Device-Assisted Healing

Negative pressure systems may be the most commonly applied and studied devices used to assist in wound healing. Systematic reviews have looked at negative pressure therapy in a variety of acute and chronic wound types.149 Study quality remains limited with no consistent evidence to support meaningful wound healing benefits. Despite limited data on efficacy, negative pressure devices are routinely used for both acute and chronic wounds.150–152 Both electrical and mechanical force can be used to power these negative pressure devices. Mechanical force was found to be noninferior to electrical force in one study.153

Electrical stimulation for wound healing is another well-studied technology for chronic wound management. It is postulated that electrical stimulation works by reducing pathogen load, inducing angiogenesis, and increasing fibroblast proliferation. To reduced chance of skin burning, the current is generally delivered in a pulsed, direct current manner. A systematic review by Kawasaki et al.154 identified 7 suitable studies of electrical stimulation for wound
healing. Overall, electrical stimulation had few adverse effects. There was moderate quality evidence to support its use in healing pressure ulcers. Another meta-analysis demonstrated significant reduction in ulcer size of 24%–62% in 6 trials when compared with control treatments.155

Unlike electrical stimulation, studies on therapeutic ultrasound for wound healing have not demonstrated significant benefit. Several meta-analyses have been performed on a variety of wound types without evidence of improved wound healing. Three studies of ultrasound vs sham procedure on pressure ulcers failed to demonstrate benefit of this technology.156 Studies of venous ulcer healing showed initial benefit of ultrasound at 7 weeks; however, sustained results at the 12 week endpoint were not seen.157

Hyperbaric oxygen therapy in wound care has been used most successfully for managing diabetic foot ulcers. Most data for treatment of other wound types have not been positive. A 2015 systematic review identified 10 studies (N = 531) of diabetic foot ulcers. Ulcer healing was improved at 6 weeks [risk ratio (RR) 2.35, 95% confidence interval (CI) 1.19–4.62; P = 0.01], however, this was not sustained at 1 year. There was no reduction in rate of limb amputation. One trial of venous ulcers and “mixed” ulcers were reviewed with reduction in ulcer area at 4–6 weeks, however, both studies were very small in size. There were no studies of arterial or pressure ulcerations.158

Topical Wound Treatments

Interventions to reduce wound bed pressure have focused on repositioning and support surface technologies. A randomized clinical trial in nursing homes studied turning intervals of 2, 3, and 4 hours to reduce pressure ulcer development in moderate-high risk individuals. Overall 2% of the population developed a pressure ulceration, and there was no difference between the groups at different turning intervals.159 In a treatment trial, nursing home residents with stage 1 pressure ulcerations were randomized to 2-hour vs 4-hour turning intervals. There was no difference in ulcer progression between the groups.160

In its fourth update, a Cochrane meta-analysis of support surfaces to prevent pressure ulceration was performed. Fifty-nine trials were identified, but little high quality data was noted. Studies did support the use of foam alternatives to standard hospital mattresses. The merits of other pressure reducing overlays is unclear.161 Once a pressure ulcer has been identified, treatment with specialty mattresses or overlay product may reduce pressure, but little data demonstrates benefit of one product type (air vs foam) over another.162

Many skin preparations have been proposed to prevent pressure ulcer development. These may include dressings, topical gels or creams, or barrier products to reduce skin maceration. Although quality of studies was poor for pooling of data, there was some evidence that topical dressings applied to pressure areas may reduce pressure ulcer incidence; RR 0.21 (95% CI 0.09–0.51; P = 0.0006). Similarly, use of topical agents may reduce the pressure ulcer incidence by 36%; RR 0.64 (95% CI 0.49–0.83; P = 0.0008).163

In treating pressure ulcers, there is insufficient high quality data to determine whether certain topical antiseptics or antimicrobial agents promote wound healing.164 Similarly, there is little evidence, including a 2017 meta-analysis, that shows certain classes of topical dressing are superior to others for wound healing.165

References


