

# CLINICAL GUIDELINE:

## IMAGING UTILIZATION Abdominal Pain



Physician Clinical Integration  
Network, LLC

### Scope

Abdominal pain, defined as “pain of nontraumatic origin with a maximum duration of 5 days,” accounts for 7-10% of all Emergency Department visits [1].

This clinical guideline focuses on appropriate use of diagnostic imaging in adult patients presenting with abdominal pain. The American College of Radiology (ACR) has developed clinical guidelines to assist physicians in selecting the most appropriate imaging study, based on their assessments [12]. These guidelines are to be used to appropriately order imaging studies in this patient cohort.

Providers should use their own clinical judgment and experience when assessing and treating patients with abdominal pain. A quantitative hCG should be performed on female patients of child-bearing age.

### Guidance

The PCIN Quality Committee and its designees reviewed the available information in the medical literature and societal guidelines on the evaluation and management for imaging utilization for abdominal pain patients, as well as information derived from their clinical practices to devise these guidelines.

#### Population Included

- Adult patients (age > 18)
  - Ambulatory setting
  - Emergency setting

#### Exclusions

- Women who are pregnant or think they are pregnant
- Males with potential testicular torsion
- Females with potential ovarian torsion or ectopic pregnancy
- Acute abdomen in a hemodynamically unstable patient

## Recommendations

- ✓ A thorough and accurate history and physical examination should be performed on all patients presenting with abdominal pain.
- ✓ Consideration should be given to special populations upon examination including males with potential testicular torsion, females with ovarian torsion or ectopic pregnancies, and the elderly.
- ✓ Evidence-based recommendations provided by the ACR should be followed for evaluating causes of acute abdominal pain (Tables 2-6).
- ✓ Specific imaging tests should be considered based on the ACR's evidence-based recommendations for evaluating select causes of acute abdominal pain (Table 1).
  - Ultrasonography is the recommended initial imaging test for patients presenting with Right Upper Quadrant (RUQ) pain and suspected cholecystitis.
  - Ultrasonography or CT with contrast is the recommended initial imaging test for patients with suspected acute appendicitis.
  - A Multidetector CT (MDCT) is the recommended initial imaging test for evaluating patients with acute Left Upper Quadrant (LUQ) pain.
  - A quantitative hCG should be performed on female patients of child-bearing age.
  - Ultrasonography is the recommended initial imaging test for pregnant women; MRI performed upon insufficient ultrasound findings.
- ✓ Management and treatment of patients with abdominal pain should be tailored to the diagnosis. Providers should use their own discretion and experience when providing treatment options.

## Rationale

### Assessment of Abdominal Pain

Evaluating abdominal pain can be confounding, especially in circumstances where the source of pain is from a non-abdominal source manifested as an intra-abdominal process. A thorough and accurate history and physical examination should be obtained. Essential to determining the acuity of the problem, providers should identify the rapidity of the onset of the pain. Further evaluating the quality, character, and severity of the pain can aid in developing an initial differential diagnosis. Monitoring for red flags can help providers diagnose patients presenting with abdominal pain [2]:

- Sudden onset with maximal intensity pain
- Pain that disrupts sleep
- Severe pain >6 hours
- Pain followed by emesis
- Migration or localization of pain
- Pain with movement
- Inability to maintain oral intake
- Fever
- Pain out of proportion to examination

Clinicians should consider referred pain from non-abdominal organ systems. A genitourinary assessment is necessary to rule out testicular or ovarian torsion or diseases presenting with abdominal pain [3,4]. Pneumonia or heart disease can be present with abdominal pain. Mesenteric ischemia [5] or aortic dissection can appear with non-specific abdominal pain. Aortic aneurysms can exhibit with flank pain and hematuria [3, 6]. Special consideration should be noted as to whether the patient has a history of travel, food or water consumption from possible contaminated sources, ill contacts at home, or toxic exposure [3].



## Atypical Presentation of Abdominal Pain

When abdominal pathology does not present with easily recognizable signs and symptoms, the clinician should consider uncommon pathologies including, but not limited to, metabolic instabilities, endocrine disorders, heavy metal toxicity, adverse effects from medication (i.e., opiate withdrawal or metformin initiation), or rheumatological disease [2]. The elderly, post-bariatric surgery patients, psychiatric patients, pregnant patients, and immunosuppressed patients are all at-risk populations vulnerable to a delay in diagnosis.

## Imaging Utilization for Patients with Abdominal Pain

### **Right Upper Quadrant (RUQ) (Table 2)**

Abdominal imaging studies provide limited value for evaluating RUQ pain. Ultrasonography is the recommended initial imaging test of choice per the ACR's "Appropriateness Criteria" [11]. Ultrasound is more readily available, can evaluate intrahepatic and extrahepatic bile ducts, has shorter study times, provides morphologic evaluation, confirms the presence or absence of gallstones, and prevents patient exposure to ionizing radiation [11-12].

Cholescintigraphy has the highest diagnostic accuracy (sensitivity 96% and specificity 90%) [13] of all imaging methods in the detection of acute cholecystitis; however, exposes the patient to ionizing radiation [11]. CT has not been widely studied in the evaluation of RUQ pain. Several small studies suggest MRI can be useful in evaluating acute cholecystitis, with a sensitivity (85%) and specificity (81%), similar to an ultrasound. MRI is beneficial in visualizing hepatic and biliary abnormalities otherwise unable to be characterized by sonography [13]. The cost-benefit profile should be reviewed before more advanced imaging studies are ordered.

### **Right Lower Quadrant (RLQ) (Table 3)**

Acute Appendicitis (AA) is the most common cause of RLQ pain [12]. The ACR's "Appropriateness Criteria" recommends CT with contrast as the initial imaging test as the sensitivity and specificity (91% and 90%, respectively) are better when compared to ultrasonography (78% and 83%, respectively) [8, 10, 12, 14]. The ACR supports the use of CT due to its consistent results; whereas ultrasonography is highly operator-dependent and relies upon the skill and experience level of the technologist [12]. Other sources support the use of ultrasound technology as the first imaging modality for diagnosing acute appendicitis, based on ionization level and cost. In this case, a CT may be performed if the diagnosis of AA is unclear [20]. Pregnant patients with suspected appendicitis should have an ultrasound of the abdomen, followed by MRI without contrast of the abdomen and pelvis if the ultrasound is negative or equivocal [10,14]. MRI for acute appendicitis has not been thoroughly researched with limitations including greater cost, longer acquisition time, and less clinical availability [14].

### **Left Upper Quadrant (LUQ) (Table 4)**

There is no definitive imaging method to aid in the evaluation of LUQ pain. The primary imaging diagnostic for evaluating patients with an acute abdomen is a CT Scan [3, 7-9]. Imaging protocols may be used but should be tailored if a specific diagnosis is suspected. Contrast-enhanced, dual-phase CT is advocated for patients with suspected pancreatitis, left pyelonephritis, or splenic pathology evaluation. IV contrast is beneficial in detecting and characterizing LUQ abscesses, suspected diverticulitis, and suspected colonic ischemia [7, 9].

Ultrasonography is useful in screening for renal abnormalities, determining splenic size, and LUQ fluid collections. Oral contrast, when appropriate, may better delineate LUQ abscesses, fluid collections, and inflammatory processes. Since LUQ structures occupy multiple planes, 3D post-processing techniques (Maximum Intensity Projection [MIP], Multiplanar Reconstruction [MPR], volume rendering, surface shading techniques) may be beneficial if available [7-9]. An MRI provides good diagnostic performance when evaluating acute pancreatitis, splenic abnormalities, acute infections, infarcts, and hemorrhage [7, 10]; however, the cost/benefit profile should be evaluated when choosing an imaging modality.

### **Left Lower Quadrant (LLQ) (Table 5)**

The most common cause of LLQ pain in patients is acute sigmoid and/or descending diverticulitis. Diverticulitis is often diagnosed clinically and without radiologic examination. In cases of an unclear diagnosis or suspected complications, CT with oral and/or colonic contrast for bowel luminal visualization is almost universally the imaging method of choice. It provides high sensitivity (>95%) and specificity, as well as the ability to provide visualization of other possible LLQ pain sources that mimic diverticulitis [12, 15].

Ultrasonography has also been used to evaluate suspected diverticulitis, yielding similar sensitivity to that of CT scans; however, results are variable due to operator technique, and limitations of patient positioning [12]. MRI is a novel modality utilized in the evaluation of diverticulitis, with preliminary data suggesting a sensitivity of 86-94% and a specificity of 88-92% [15].



## Nonlocalized Abdominal Pain

The ACR has specific criteria for imaging of acute nonlocalized abdominal pain and fever (suspected abdominal abscess [Table 6]). Tables 2-6 provides the ACR's "Appropriateness Criteria" for imaging of abdominal pain by pain's location [12, 16].

## Imaging Women of Child-Bearing Age

Patients of child-bearing age should have an hCG test before performing diagnostic imaging [12]. Ultrasonography is the imaging modality of choice for pregnant women; MRI performed when ultrasound findings do not establish the diagnosis, and CT cannot be used due to concerns regarding the risk of radiation to the fetus [10]. MRI has been shown to have excellent sensitivity and specificity in the diagnosis of appendicitis in pregnant women and is useful for evaluating other causes of abdominal pain [12, 17].

## Treatment of Patients with Abdominal Pain

The treatment of abdominal pain is diagnosis specific; therefore, the following recommendations do not encompass all recommendations but provide a high-level overview of treatment recommendations. Providers should use their own discretion and experience when providing treatment options.

In the Primary Care setting, management and treatment of patients with acute or chronic abdominal pain should be specific to diagnosis. The acute abdomen requires immediate intervention to prevent patient decline [3]. Patients with an undiagnosed etiology of abdominal pain should be followed closely and referral to a specialist may be considered [3].

In the Emergency Department setting, any hemodynamically unstable patient requires immediate intervention with a STAT work-up for life-threatening diagnoses such as abdominal aortic aneurysm, myocardial infarction, perforated viscus, mesenteric ischemia, sepsis, adrenal insufficiency, or ruptured ectopic pregnancy. This includes the following [18-19]:

- Ultrasound Focused Assessment with Sonography for Trauma (FAST) exam
- CT imaging (including the aorta)
- Laboratory testing including Complete Blood Count (CBC), Comprehensive Metabolic Panel (CMP), lactic acid, International Normalized Ratio (INR), lipase, cardiac profile, quantitative hCG
- EKG
- Chest X-ray

Patients with intra-abdominal catastrophes or acute abdominal findings require STAT surgical consultation and rapid surgical intervention. Gynecologic diagnoses such as ectopic pregnancy or ovarian torsion require gynecologic consultation and intervention [2]. Patients with a negative work-up, who respond to care, and can eat and drink may be discharged with close follow-up and referral to the primary care physician [18,19].



## References

1. Cervellin G, Mora R, Ticinesi A, et al. Epidemiology and outcomes of acute abdominal pain in a large urban Emergency Department: retrospective analysis of 5,340 cases. *Ann Transl Med*. 2016;4(19):362. doi:10.21037/atm.2016.09
2. Brown, H., & Kelso, L. (2014). Abdominal Pain: An Approach to a Challenging Diagnosis. *AACN Advanced Critical Care*, 25(3), 266-278. doi:10.1097/NCI.0000000000000042
3. Cartwright, S. L. & Knudson, M. P. (2008). Evaluation of acute abdominal pain in adults. *American Family Physician*, 77(7), 971-978
4. Kruszka, P. S. & Kruszka, S. J. (2010). Evaluation of acute pelvic pain in women. *American Family Physician*, 82(2), 141-147
5. Kim, A. Y. and Ha, H. K. (2003). Evaluation of suspected mesenteric ischemia. *Radiologic Clinics of North America*, 41(2), 327-342. Doi: 10.1016/S0033-8389(02)00075-1
6. Lyon, C. & Clark, D. C. (2006). Diagnosis of acute abdominal pain in older patients. *American Family Physician*, 74(9), 1537-1544
7. Ecanow, J., & Gore, R. (2015). Evaluating Patients with Left Upper Quadrant Pain. *Radiologic Clinics of North America*, 53(6), 1131-1157. doi:10.1016/j.rcl.2015.06.003
8. Paulson, E., Jaffe, T., Thomas, J., Harris, J., & Nelson, R. (2004). MDCT of Patients with Acute Abdominal Pain: A New Perspective Using Coronal Reformations from Submillimeter Isotropic Voxels. *American Journal of Roentgenology*, 183(4), 899-906. doi:10.2214/ajr.183.4.1830899
9. Thoeni, R. F., Faerber, E. N., Servaes, S., Towbin, A. J., Westra, S. J., Platt, J. F., Silverman, S. G. (2014). ACR-SPR practice parameter for the performance of computed tomography (CT) of the abdomen and computed tomography (CT) of the pelvis. *American College of Radiology*. Retrieved from <http://www.acr.org/guidelines>
10. Singh, A., Danrad, R., Hahn, P., Blake, M., Mueller, P., & Novelline, R. (2007). MR Imaging of the Acute Abdomen and Pelvis: Acute Appendicitis and Beyond. *Radiographics*, 27(5), 1419-1431. doi:10.1148/rg.275065021
11. Yarmish, G. M., Smith, M. P., Rosen, M. P., Baker, M. E., Blake, M. A., Cash, B. D., Tulchinsky, M. (2013). American College of Radiology ACR appropriateness criteria: right upper quadrant pain. Retrieved from <http://www.acr.org/~media/ACR/Documents/AppCriteria/Diagnostic/RightUpperQuadrantPain.pdf>
12. Cartwright, S. L. & Knudson, M. P. (2015). Diagnostic imaging of acute abdominal pain in adults. *American Family Physician*, 91(7), 453-459
13. Kiewiet, J., Leeuwenburgh, M., Bipat, S., Bossuyt, P., Stoker, J., & Boermeester, M. (2012). A Systematic Review and Meta-Analysis of Diagnostic Performance of Imaging in Acute Cholecystitis. *Radiology*, 264(3), 708-720. doi:10.1148/radiol.12111561
14. Smith, M. P., Katz, D. S., Rosen, M. P., Lalani, T., Carucci, L. R., Cash, B. D., & Yee, J. (2013). American College of Radiology ACR appropriateness criteria: right lower quadrant pain—suspected appendicitis. Retrieved from <https://acsearch.acr.org/docs/69357/Narrative/>
15. McNamara, M., Lalani, T., Camacho, M., Carucci, L., Cash, B., Feig, B., . . . Rosen, M. (2014). ACR Appropriateness Criteria® Left Lower Quadrant Pain—Suspected Diverticulitis. *American College of Radiology*, 1-7. Retrieved December 7, 2015, from <https://acsearch.acr.org/docs/69356/Narrative/>
16. Yaghmai, V., Rosen, M. P., Lanai, T., Baker, M. E., Cash, B. D., Fidler, J. L., Yee, J. (2012). Acute (nonlocalized) abdominal pain and fever or suspected abdominal abscess. *American College of Radiology*. Retrieved from <http://www.acr.org/Quality-Safety/Appropriateness-Criteria>
17. Guenin, M. A., Bigongiari, L. R., Hernanz-Schulman, M., Wagner, L. K., Brody, A. S., Chapman, T., & McClam, S. L. (2014). ACR-SPR practice parameter for imaging pregnant or potentially pregnant adolescents and women with ionizing radiation. Retrieved from [http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/Pregnant\\_Patients.pdf](http://www.acr.org/~media/ACR/Documents/PGTS/guidelines/Pregnant_Patients.pdf)



18. Adams, J. G., Barton, E. D., Collings, J. L., DeBlieux, P. M. C., Gisondi, M. A., and Nadel, E. S. (2015). *Emergency Medicine Review*. Philadelphia, PA: Elsevier
19. Mattu, A., Chanmugam, A. S., Swadron, S. P., Tibbles, C. D., and Woolridge, D. P. (2010). Avoiding common errors in the emergency department. Philadelphia, PA: Lippincott Williams & Wilkins
20. Mostbeck, G., Adam, E. J., Nielsen, M. B., Claudon, M., Clevert, D., Nicolau, C., Owens, C. M. (2016). How to diagnose acute appendicitis: ultrasound first. *Insights into imaging*, 7(2), 255–263. doi:10.1007/s13244-016-0469-6



## Appendix

**Table 1**

**Imaging Recommendations for Evaluating Select Cause of Acute Abdominal Pain in Adults**

| Likely Clinical Diagnosis   | Imaging Recommendation   | Comments  |
|-----------------------------|--|---|
| Abscess                     | CT of abdomen and pelvis with contrast media                         |   |
| Acute Pancreatitis          | Ultrasonography of abdomen   | Consider CT if ultrasonography is non-diagnostic, presentation is atypical, or patient is critically ill  |
| Appendicitis                | Abdominal ultrasound or CT of abdomen and pelvis with contrast media | If the diagnosis is unclear following an ultrasound, a CT scan should be considered [20]  |
| Cholecystitis               | Ultrasonography of abdomen   | Cholescintigraphy or CT may be considered if ultrasonography is equivocal   |
| Crohn's Disease             | CT enterography  | Choice of examination depends on institutional preferences and resources  |
| Diverticulitis              | CT of abdomen and pelvis with contrast media                         | Patients with typical symptoms and no suspected complications may not require imaging   |
| Ectopic Pregnancy           | Ultrasonography of pelvis (transvaginal and transabdominal)          |   |
| Gastroenteritis             | Imaging not typically indicated                                      |   |
| Herpes Zoster Infection     | Imaging not typically indicated                                      |   |
| Intrauterine Pregnancy      | Ultrasonography of pelvis (transvaginal and transabdominal)          |   |
| Irritable Bowel Syndrome    | Imaging not typically indicated                                      |   |
| Mesenteric Ischemia         | CT angiography of abdomen with contrast media                        | Conventional angiography is invasive but may be considered to diagnose and treat with a single procedure  |
| Muscle Strain               | Imaging not typically indicated                                      |   |
| Nephrolithiasis             | CT of abdomen and pelvis without contrast media                      | Ultrasonography may be considered if CT is unavailable; ultrasonography may help detect obstruction but has poor sensitivity for visualizing stones |
| Ovarian Torsion             | Ultrasonography of pelvis (transvaginal and transabdominal)          |   |
| Pelvic Inflammatory Disease | Imaging not typically indicated                                      |   |
| Perforated Viscus           | CT of abdomen  |   |
| Small Bowel Obstruction     | CT of abdomen and pelvis with contrast media                         | Conventional radiography may be appropriate for initial evaluation  |
| Urinary Tract Infection     | Imaging not typically indicated                                      |   |

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**Table 2****Right Upper Quadrant Pain Imaging Recommendations**

| <b>Radiologic Procedure</b>   | <b>Rating</b> | <b>Comments</b>  |
|---|---------------|--|
| Ultrasonography of abdomen  | 9             |  |
| MRI of abdomen without and with contrast media  | 6             | See statement regarding contrast media under Anticipated Exceptions*                                   |
| Cholescintigraphy   | 6             | Based on ultrasound findings, this generally should follow ultrasonography of the right upper quadrant |
| CT of abdomen with contrast media   | 6             |  |
| MRI of abdomen without contrast media   | 4             |  |
| CT of abdomen without contrast media  | 4             |  |
| CT of abdomen without and with contrast media   | 3             |  |
| <b>Rating scale:</b><br><b>1,2,3 = usually not appropriate</b><br><b>4,5,6 = may be appropriate</b><br><b>7,8,9 = usually appropriate</b> |               |  |

\* Anticipated Exceptions: nephrogenic systemic fibrosis is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (i.e., <30 mL per minute per 1.73 m<sup>2</sup>), and almost never in other patients. There is growing literature regarding nephrogenic systemic fibrosis; although some controversy and lack of clarity remain. There is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated glomerular filtration rates of <30mL/min/1.73m<sup>2</sup>

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**Table 3****Right Lower Quadrant Pain Imaging Recommendations (Suspected Appendicitis)**

| <b>Radiologic Procedure</b>   | <b>Rating</b> | <b>Comments</b>   |
|---|---------------|---|
| CT of abdomen and pelvis with contrast media  | 8             | Use of oral or rectal contrast media depends on institutional preference        |
| CT of abdomen and pelvis without contrast media   | 7             | Use of oral or rectal contrast media depends on institutional preference        |
| Ultrasonography of abdomen  | 6             | Perform this procedure with graded compression                                  |
| Ultrasonography of pelvis   | 5             | This procedure is appropriate in women with pelvic pain                         |
| MRI of abdomen and pelvis without and with contrast media   | 5             | See statement regarding contrast media under *Anticipated Exceptions (Table 2)  |
| Radiography of abdomen  | 4             | This procedure may be useful when there is concern for perforation and free air |
| CT of abdomen and pelvis without and with contrast media  | 4             | Use of oral or rectal contrast media depends on institutional preference        |
| MRI of abdomen and pelvis without contrast media  | 4             |   |
| Radiography with contrast enema   | 2             |   |
| Technetium 99m white blood cell scan of abdomen and pelvis  | 2             |   |
| <b>Rating scale:</b><br><b>1,2,3 = usually not appropriate</b><br><b>4,5,6 = may be appropriate</b><br><b>7,8,9 = usually appropriate</b> |               |   |

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**Table 4****Left Upper Quadrant Pain Imaging Recommendations**

| <b>Radiologic Procedure</b>   | <b>Rating</b> | <b>Comments</b> |
|---|---------------|-----------------|
| There is not a definitive imaging method to evaluate LUQ abdominal pain |               |                 |

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**Table 5****Left Lower Quadrant Pain Imaging Recommendations (Suspected Diverticulitis)**

| <b>Radiologic Procedure</b>   | <b>Rating</b> | <b>Comments</b>  |
|---|---------------|--|
| CT of abdomen and pelvis with contrast media  | 9             | For the procedure, oral and/or colonic contrast may be helpful for bowel luminal visualization |
| CT of abdomen and pelvis without contrast media   | 6             |  |
| CT of abdomen and pelvis without and with contrast media  | 5             |  |
| MRI of abdomen and pelvis without contrast media  | 5             |  |
| MRI of abdomen and pelvis without and with contrast media   | 5             | See statement regarding contrast media under *Anticipated Exceptions (Table 2)                 |
| Radiography with contrast enema   | 4             |  |
| Ultrasonography of abdomen, transabdominal graded compression   | 4             |  |
| Radiography of abdomen and pelvis   | 4             |  |
| Ultrasonography of pelvis, transvaginal   | 2             |  |
| <b>Rating scale:</b><br><b>1,2,3 = usually not appropriate</b><br><b>4,5,6 = may be appropriate</b><br><b>7,8,9 = usually appropriate</b> |               |  |

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**Table 6****Nonlocalized Abdominal Pain Imaging Recommendations for Acute Nonlocalized Abdominal Pain and Fever (Suspected Abdominal Abscess)**

| <b>Radiologic Procedure</b>   | <b>Rating</b> | <b>Comments</b>  |
|---|---------------|--|
| CT of abdomen and pelvis with contrast media  | 8             |  |
| CT of abdomen and pelvis without contrast media   | 6             |  |
| Ultrasonography of abdomen  | 6             |  |
| Radiography of abdomen  | 6             | To evaluate for bowel perforation  |
| MRI of abdomen and pelvis without contrast media  | 5             |  |
| MRI of abdomen and pelvis without and with contrast media   | 5             | See statement regarding contrast media under *Anticipated Exceptions (Table 2)                       |
| Radiography of upper gastrointestinal series with small bowel follow-through  | 4             |  |
| Radiography with contrast enema   | 4             |  |
| CT of abdomen and pelvis without and with contrast media  | 3             | May be helpful in select cases; however, should be used with caution due to increased radiation dose |
| Gallium 67 scan of abdomen  | 3             |  |
| Technetium 99m white blood cell scan of abdomen and pelvis  | 3             |  |
| Indium 111 white blood cell scan of abdomen and pelvis  | 3             |  |
| <b>Rating scale:</b><br><b>1,2,3 = usually not appropriate</b><br><b>4,5,6 = may be appropriate</b><br><b>7,8,9 = usually appropriate</b> |               |  |

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