

**Supplemental Table 1****Case Study #1: A Patient Decision Aid (PDA) for Imaging Pediatric Headache***By Nadja Kadom, MD, FACP*

We developed a PDA that can be used in children with headaches. The initial motivation for developing this PDA for pediatric headache imaging came from a pediatric neuroradiologist. The goal was to decrease seemingly inappropriate imaging utilization after finding a rate of 71% normal imaging results for this indication at our institution [1].

A deeper dive into the literature and surveys of our referring providers helped us understand the complexity of factors that result in seemingly inappropriate imaging use for children with headaches, which include dealing with parental anxiety, difficulty in reliably examining certain children, defensive medicine, and lack of practice standards, as well as lack of awareness of evidence-based guidance. As a first step, we performed a systematic review and summarized existing evidence, then developed clinical algorithms for the imaging management of children with headaches [2].

To bring this evidence-based information to the point of care and support the shared-decision making process, we developed a PDA. The PDA assists patients in weighing the scientific evidence, their provider's opinion, alternatives to imaging, and consequences of getting imaging versus not getting imaging against their personal preferences. Considering all this information, patients and families are empowered to decide for themselves whether they want to get imaging or not. This tool has undergone alpha testing and feasibility testing in the Headache Clinic at Children's Healthcare of Atlanta. The tool is now pending beta testing, final modifications based on feedback, and subsequent local implementation.

**Supplemental Table 2****Case Study #2: Our Pediatric Radiology Website***By Nadja Kadom, MD, FACP*

Children's Healthcare of Atlanta in conjunction with the Department of Pediatric Radiology designed the radiology website with patients in mind: [www.choa.org/medical-services/radiology](http://www.choa.org/medical-services/radiology). The site provides a number to call, as well as links to the online portal and for paying a bill. The site informs of the imaging modalities that are available, describes the value this facility brings to pediatric imaging, introduces the radiologists, and indicates all available imaging locations. From here, patients can follow additional links on MRI and interventional procedures, and a link on how to prepare for the imaging test. The latter link focuses on items to bring to keep children of different ages comfortable, such as bringing their favorite blanket or toy and advice on what to say to the child in anticipation of discomfort and crying.

**Supplemental Table 3****Case Study #3: Reading room in brain tumor clinic***By Alexander Nemeth, MD*

At Northwestern Memorial Hospital in Chicago, the Malnati Brain Tumor Institute (MBTI) has had a working neuroradiology reading room in its patient clinic since 2019. This reading room has three full PACS workstations and a fourth post-processing

workstation with room for radiology trainees, neuroradiology attendings, and allowing direct consultation with ordering providers. The room serves as the location of the functional neuroradiology rotation for our neuroradiology fellows and radiology residents. The ordering providers include neuro-oncologists and neurosurgeons as well as advanced practice nurses. The goal has been to optimize clinical care of patients by allowing expeditious and direct interactions among ordering providers and neuroradiology.

In addition to increasing interactions with the ordering providers for clinical care, there have been increasing collaborations among the providers and neuroradiology in overall patient engagement. In the time since opening the reading room in the MBTI clinic, neuroradiology has been invited to speak at the MBTI Patient and Caregiver Forum and has made a video outlining the role of neuroradiology in the diagnosis and treatment of brain tumor patients. The multidisciplinary space of the MBTI has also allowed patient interactions for clinical trials including patient recruitment and follow up for imaging and tumor treatment. MBTI informational materials such as a website and pamphlets have included pictures of the neuroradiology reading room that is in the MBTI clinic, thus emphasizing the role of neuroradiology in optimal patient care to prospective brain tumor patients. A brain tumor board has been video-recorded for publicity and marketing, including the entire multidisciplinary team of which neuroradiology took part. Some of the neuroradiologists have also been active in MBTI fundraising and in that capacity have interacted with donors and patients.

Different from the experience at Emory [3], neuroradiology in the MBTI at Northwestern does not typically interact with patients directly in the reading room, nor does neuroradiology provide results reporting directly to patients. However, involvement of neuroradiology at Northwestern in the MBTI has allowed for more direct interactions with clinical providers and greater patient engagement as outlined above.

#### **Supplemental Table 4**

Case Study #4: Case study: A Companion Case of Embedded reading rooms: One Stop Shop

*By Yvonne W Lui, MD, FACR*

At the NYU Grossman School of Medicine we are encountering the placement of neuroradiologist reading areas within relevant referring physician clinical care areas with increasing frequency. The days of conducting routine radiology rounds, as was so common in the past, are gone; however, the benefits of having those clinical and radiological interactions remain. As such, NYU Langone Health as well as others have moved towards embedding radiologists in relevant clinical areas to facilitate those interactions, both formal and ad hoc. The result is an efficient way to arrive at consistent and coherent care plans and foster collaboration across departments in multidimensional ways. We currently have these embedded reading areas at the cancer center in the head and neck surgical areas as well as at the main neurosurgical office suite. At NYU, we send neuroradiology faculty as opposed to trainees to embedded areas to interact directly with referring physicians and patients. There are typically two workstations the way the reading rooms are set up and a trainee can sometimes also be present. In New York City and other urban areas, securing appropriate space can often be a challenge for Radiology departments as well as other departments. We note that our referring physicians support our presence in their areas by allocating some of their own precious office space to Radiology. We are

happy to support and welcome patients to be invited from the waiting area or examining room into the embedded reading room to have the radiologist review images directly with them. Finally, we incorporate a specific designation on the electronic PACS worklist for any outpatient studies of patients who have same-day scheduled physician visits so that these can be dictated as soon as possible and prior to the patient encounter. In summary, referring physicians are enthusiastic about embedded reading rooms and these help to provide coordinate care and can facilitate patient direct access to attending neuroradiologists. Across different centers, embedded reading rooms can be implemented differently incorporating radiologists of differing training and seniority.

#### **Supplemental Table 5**

##### **Case Study #5: Bad News Bear Program**

*By Nadja Kadom, MD*

The pediatric neuroradiology section at Children’s Healthcare of Atlanta developed a protocol that becomes activated when a critical finding is made during an outpatient imaging study (Figure 2). Most commonly, this is a brain tumor in a child with headaches or seizures. The initial action in the protocol involves assigning a single point person that will coordinate the events that ensue. The point person will (1) escort the family to a private room, (2) place a call to the radiologist, and then (3) stay with the family. The radiologist will first seek to contact the patient’s referring provider, inform them of the findings and ask them how they prefer to manage the situation. Most commonly, referring providers will speak with their patients via phone and advise them to follow the radiologist’s instructions. The radiologist would then arrange an immediate consult with neurosurgery, which most of the time results in patient admission to the hospital, especially in the setting of hydrocephalus. If neurosurgery is not available, for example for patients at remote imaging facilities, the radiologist will explain the imaging findings and next steps to the families. Additional support for families can be called in, such as chaplains or child life specialists. The protocol is referred to as the “Bear’s Bundle” to invoke the idea of a teddy bear that is comforting.

#### **Supplemental Table 6**

##### **Case Study #6: Video Reporting**

*By Yvonne W. Lui, MD, FACR*

Radiologists at NYU Grossman School of Medicine, in collaboration with Visage Imaging GmbH and Siemens Healthineers have been creating video reports that go directly to a patient portal and can be accessed immediately after the radiologist signs the case by patients through an online/phone app [4]. These video reports incorporate traditional radiological imaging as well as photorealistic renderings of 3D imaging datasets in appropriate cases along with audio of the radiologist explaining the findings in plain language. In a study of their initial experience, average time to create a video was 55 seconds. Of patients who responded to an initial survey regarding the video report, 91% reported liking receiving both the written formal report and the video report. Overall video reports were rated 4.7 out of a possible 5 stars by patients. These videos complement technical formal radiological reporting which can be difficult for patients to decipher and are sometimes even unclear to referring physicians in terms of the clinical

and follow-up ramifications. Patients have unlimited access to their video reports and in the published study, many videos were viewed multiple times, as many as 19 times. Example of a video report can be found here: <https://nyulangone.org/news/study-video-radiology-reports-important-tool-help-patients-understand-imaging-test-results>.

#### Supplemental Table 7

##### Case Study #7: Actionable Incidental Findings Notifications to Patients

By Jeffrey B. Rykken, MD

We are currently working towards implementing a direct-to-patient system for actionable incidental findings (AIF). This system will supplement the work that our Customer Solutions Center is currently doing for ensuring that imaging findings that have been flagged by a radiologist as actionable are seen by members of the patient's health care team.

We plan to use the language proposed in Chris Moore et al.'s recent white paper [5] as a template for patient communication, but with a few changes...for instance we removed the word "cancer" to make it less scary sounding, yet hopefully without diminishing the importance of compliance with follow-up. This is our current version:

*"The diagnostic imaging (x-ray, CT or "CAT" scan, MRI, nuclear medicine study, or ultrasound) that was performed during your visit revealed an "incidental finding". This is a finding that is not necessarily related to your symptoms or complaints. While this finding is not definitely abnormal, further evaluation is appropriate. Follow-up is recommended to ensure that it is not worrisome or to allow for early diagnosis and treatment. You should discuss this with your primary care physician and/or otherwise follow up in the recommended timeframe, if provided."*

Discussions surrounding the verbiage and how these messages could be shared with patients are still ongoing. For example, we are debating whether this message should be included in the imaging report automatically when it is flagged as an AIF, and whether it should also be shared via a separate letter or Epic My Chart message.

#### Supplemental References:

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