The literature suggests that variable levels of discrepancies exist in pathological diagnosis. Indeed, mandatory histological reviews are important for sarcoma patients due to recent studies that have reported discordance rates from 27%–42% in this population [1–2]. Sarcomas are malignant tumors developed in soft tissue, bone, skin, and internal organs. The majority of soft tissue tumors are benign, and they are 100× more common than malignant lesions. Moreover, sarcomas include more than 50 histological subtypes, which are all rare tumors. Therefore, accurate diagnoses can be difficult for non-specialized pathologists [3–5]. Major discordance in initial diagnoses could have a strong impact on therapeutic strategies and costs. The aim of this study was to compare the costs of disease management based on revised diagnoses after centralized histological reviews for sarcoma, GIST, and desmoid tumors with the costs based on diagnoses without second opinion.

METHODS

OBJECTIVES

METHODS

RESULTS

• Study design

- This study was performed retrospectively using prospectively implemented databases. The inclusion criteria were patients who underwent histological review within the RRePS (réseau de référence en pathologie des sarcomes) network (supported by the French NCIC) in 2010. The network comprises a total of 22 French pathology centers, including three coordinating centers (Institut Bergonié Bordeaux, Centre Léon Bérard Lyon, and Institut Gustave Roussy Villejuif) and 19 referring centers throughout the country.

- Diagnoses were considered discordant when the final diagnosis was not classified in the same category of tumor (sarcoma, GIST, desmoid tumor, intermediate malignancy, benign tumor and non-mesenchymal malignant tumor).

- The present study received approval from the Consultative Committee on Data Processing Regarding Research in the Field of the Health (CCTRSH, n°235786) and the National Committee for Protection of Personal Data (CNIL, n°910980).

- This study was funded by the National Cancer Institute (INCa).

- Disease management

- Disease management was defined for each patient with a discordant diagnosis identified after a histological review performed within the RRePS network.

- Disease management (followed)

- Disease management, including the initial treatments and a one year follow-up period, were defined by experts based on (i) the initial diagnosis (diagnoses before reviews) and (ii) the revised diagnoses after centralized histological reviews. Other characteristics of the patient (e.g. age), and disease (e.g. stage) were also taken into account.

- Disease management were made using national or international guidelines when available. All of the strategies (2 per patient) were defined by the authors.

- Cost assessment

- Costs were assessed for every disease management (2 per patient) using the same time horizon. Costs were assessed according to the French National Health Insurance (INH) perspective. Valuation was based on disease related groups (DRGs) using the French Tariffs and the Classification Commun de l’Actes Médicaux (CCAM). Costs were expressed in Euros 2013.

- A decision tree was then constructed in order to estimate the expected costs of both options: disease management based on revised diagnoses after centralized histological reviews and disease management based on diagnoses before reviews. Probabilities were based on the patients that underwent histological review within the RRePS network in 2010. Costs of histological review (€228) were based on the publication of N. Lapeyre et al. [6]. Calculations were performed using TreeAge Pro 2013®.

• Patients and probabilities

- Out of the 2,425 patients that underwent histological review, 341 patients had a major discordance in their diagnosis (14%, Figure 1). N = 10 patients were excluded from the modeling because of missing data.

- Our findings revealed a major issue with the overdiagnosis of sarcoma, which was most often confused with benign tumors (Table 1). More than two-thirds of the discordances concerning the following: a benign tumor diagnosed as sarcoma (45%); a non-sarcomatous-malignant tumor diagnosed as sarcoma (23%); and sarcoma diagnosed as a benign tumor (10%).

• Disease management

- Disease management was performed for each patient with a discordant diagnosis identified after a histological review performed within the RRePS network.

Diagnoses before reviews

<table>
<thead>
<tr>
<th>Sarcoma</th>
<th>Intermediate malignant tumor</th>
<th>GIST</th>
<th>Desmoid tumor</th>
<th>Non-sarcoma malignant tumor</th>
<th>Benign tumors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,414</td>
<td>2,425</td>
<td>3,084</td>
<td>341</td>
<td>128</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>Diagnoses after centralized histological reviews</th>
<th>Sarcoma</th>
<th>Intermediate malignant tumor</th>
<th>GIST</th>
<th>Desmoid tumor</th>
<th>Non-sarcoma malignant tumor</th>
<th>Benign tumors</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,414 patients included in the RRePS network in 2010</td>
<td>1,414</td>
<td>2,425</td>
<td>3,084</td>
<td>341</td>
<td>128</td>
<td></td>
<td></td>
</tr>
<tr>
<td>128 patients with an undefined initial diagnosis</td>
<td>128</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Table 1: Repartition of diagnoses before / after reviews according to the category of tumor

- Table 2: Number of concordant and discordant diagnoses according to the category of tumor

- Table 3: Mean costs of disease management based on revised diagnoses (in € 2013)

- In addition to the positive impact of centralized histological reviews on the quality of diagnosis for sarcoma, GIST, and desmoid tumors, this study demonstrated histological reviews lower the cost of disease management for the French INH.

CONCLUSION

- The mean cost of sarcoma ranged from €300 when confused with benign tumor to €30,141 when confused with GIST (cost of reviews included). All costs are presented in Table 3.

- The mean cost per patient reached €8,610 when disease management was based on diagnoses before reviews and €8,420 (costs of histological review included) when disease management was based on revised diagnoses after centralized histological reviews.

- The mean cost of sarcoma ranged from €300 when confused with benign tumor to €30,141 when confused with GIST (cost of reviews included). All costs are presented in Table 3.

- The mean cost per patient reached €8,610 when disease management was based on diagnoses before reviews and €8,420 (costs of histological review included) when disease management was based on revised diagnoses after centralized histological reviews.