# Costs analysis of PCR Unyvero™ i60-ITI technique for detecting microorganisms in patients with suspected chronic infection at musculoskeletal implants

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## Introduction

Although musculoskeletal implants has become an important medical procedure that improves quality of life for many patients, the majority of failures that lead to severe consequences remain unsolved. A significant proportion of these failures may be infectious[1].
Microbiological diagnosis of implant-related infection is essential for the selection of the ideal antibiotic therapy based on the individual susceptibility of any isolated micro-organisms[2,3].
Therefore, a more sensitive and faster than traditional diagnostic techniques, would result in better management of patients, allowing lower costs.
Unyvero™ i60-ITI is a polymerase chain reaction system (highly specific multiplex PCR) with fast array-based detection designed for detection of microorganisms (comprehensive results are available in approximately 4-5 h).

## Objective

This study aimed to determine the costs associated to microorganism's diagnosis in sonicate samples of musculoskeletal implants, comparing the addition of a PCR technique (Unyvero™ i60-ITI) to traditional techniques (TT) versus TT only.

## Methods

A cost analysis model was developed in Microsoft Excel® for preliminary estimation of management costs at hospital level.
Population included all patients admitted at Fundación Jimenez Diaz Hospital (May-2014 to April-2015) for musculoskeletal implant removal due to chronic infection suspect.
Removed implants were processed by sonication techniques (use of low-intensity ultrasound for the disintegration of biofilm before culture).
Sonicated samples from implants were tested for microbiological diagnosis using TT. Additionally, samples were tested using Unyvero™ i60-ITI.

A database was designed for data collection. Medical hospitals records were reviewed for clinical data retrievement:
- Sociodemographic data
- Type, dosing and antibiotic treatments
- Hospital length of stay (LOS).

Intravenous vancomycin and ceftazidime were selected as the initial empiric treatment. Replacement to a specific antibiotic was performed after microbiological diagnosis.

Total estimated costs (€, 2015) included:
- Antibiotic treatment (calculated based on ex-factory prices[4] with mandatory deduction[5])
- Hospital stay (€1,006 per day[6]).
- Unyvero™ i60-ITI kits (€350 per kit) costs.

## Results

Ten patients were finally retrieved for this preliminary analysis. (Table 1).
Average age was 75 years.
Hip and knee were the most frequent implant sites.
Average period from implant removal to final diagnosis lasted 4.60±1.35 days with TT. Unyvero™ i60-ITI diagnosis was available 24h after removal.
Average LOS was 24.4 days for TT and 23.3 days for Unyvero™ i60-ITI added to TT.
Infection suspect was confirmed in 8 (80%) patients. (Table 2)
The existence of microbiological infection was confirmed by Unyvero™ i60-ITI in 5 (62,5%) of this 8 patients with infection and was not confirmed by Unyvero TM i60- ITI in 3 (37,5%) of these 8 patients with infection.
Cost results are shown in Figure 1:
The average antibiotic treatment cost was €1,016.01/patient for TT and €976.84/patient for Unyvero™ i60-ITI added to TT.
Hospital stay cost was €25,591.26/patient for TT and €24,361.98/patient for Unyvero™ i60-ITI added to TT.
The average cost of Unyvero™ i60-ITI kits was €427.78/patient.

**The use of Unyvero™ i60-ITI reduced average total costs in €840.67/patient.**

| PATIENTS CHARACTERISTICS | |
|---|---|
| **Age, (mean± s. deviation)** | 75.39±6.31 years |
| **Gender, (%)** | |
| Woman | 80% |
| Man | 20% |
| **Location, (%)** | |
| Hip | 40% |
| Knee | 40% |
| Shoulder | 20% |
| **Comorbidities, (%)** | |
| Hypertension | 70% |
| Diabetes | 40% |
| Obesity | 10% |
| Autoimmune diseases | 20% |
| Immunodeficiency | 30% |
| **Type of infection (%)** | |
| Infection of prosthetic joints | 50% |
| Chronic infection prosthesis | 50% |
| **Symptoms, (%)** | |
| Pain | 90% |
| Joint effusion | 20% |
| Prosthetic loosening | 30% |
| Other | 50% |
| **Medical complications, (%)** | 20% |

Table 1

| MICROBIOLOGICAL DIAGNOSIS OF INFECTIONS | |
|---|---|
| **TT** | **Unyvero™ i60-ITI** |
| Enterobacter cloacae complex | Confirmed |
| Enterococcus faecalis | Confirmed |
| Klebsiella pneumoniae | Confirmed |
| Propionibacterium acnes | Not detected |
| Staphylococcus aureus | Confirmed |
| Staphylococcus epidermidis | Confirmed |
| Staphylococcus epidermidis | Not detected |
| Unspecified | Not detected |
| Not infected | Not detected |
| Not infected | Not detected |

Table 2

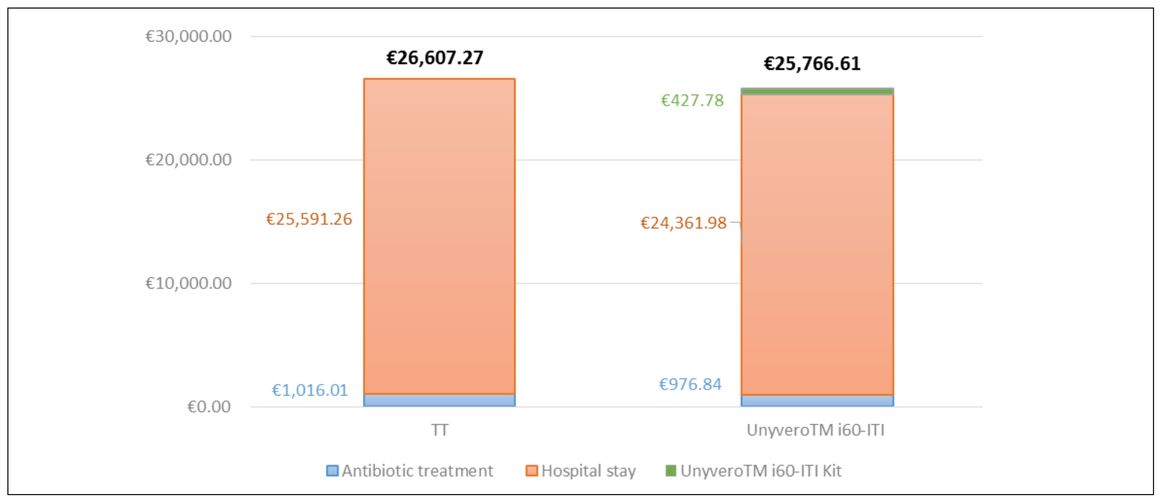


**Figure 1:** Cost per patient

## Conclusions

- Unyvero™ i60-ITI PCR for microbiological identification in musculoskeletal implants sonicated is associated to faster diagnosis and shorter hospital stays than traditional techniques only, allowing cost savings at hospital level.

### References

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