Matthias Stoll Clinic for Immunology and Rheumatology Medical University of Hanover (MHH) D-30625 Hanover Germany Stoll.Matthias@mh-hannover.de

# The economic impact of national particularities in the healthcare system – calculation for hospital-related costs from pooled **DUET trials by German diagnosis-related groups**

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Matthias Stoll,<sup>1</sup> Verena Donatz,<sup>2</sup> Chris Corbett,<sup>3</sup> Silas Martin<sup>4</sup>

<sup>1</sup>Clinic for Immunology and Rheumatology, Medical University of Hanover (MHH), Hanover, Germany; <sup>2</sup>Tibotec, Division of Janssen-Cilag GmbH, Neuss, Germany; <sup>3</sup>Tibotec BVBA, Mechelen, Belgium; <sup>4</sup>Centocor Ortho Biotech Services, LLC, Horsham, USA

## Abstract

#### Background

Superiority in virological suppression of etravirine (ETR; TMC125) + background regimen (BR; ETR arm) versus placebo + BR (placebo arm) in HIV-1-infected, treatment-experienced patients was shown in the DUET-1 and DUET-2 trials. Previous studies could demonstrate cost-effectiveness for direct costs in the ETR arm using specific national pharmacy sales prices. Additional cost-saving effects by lower hospitalisation rates have been found for the ETR arm calculating hospitalisation costs for the USA. In this study we investigate the effect of the lump sum-based reimbursement for hospitalisation by the novel German diagnosis-related groups (DRGs).

### Methods

The German DRG system was used to estimate hospital costs for each patient based on individually recorded disease characteristics and diagnoses. Exclusively for psychiatric admissions, where DRGs are not applicable, the fixed daily rate was used ( $\in$  241).

## Results

One thousand, two hundred and three patients were included: 599 vs 604 in the ETR versus placebo arms. Numbers (%) of patients hospitalised were 105 (17.5%) vs 139 (23.0%) for the ETR arm versus the placebo arm, respectively (p=0.0006) and total hospital days observed during the 48-week follow-up period were 1,702 vs 2,747. Calculated total hospital costs were €633,238 (ETR arm) vs €975,750 (placebo arm), resulting in a lower hospitalisation cost of €571 per patient in the ETR arm. Reimbursements by German DRGs are more than 75% less than recently calculated US hospitalisation costs. Reimbursements by German DRGs are comparable to USA for shorter stays (≤5 days), but up to six-fold lower for longer stays (up to 140 days).

## Conclusions

At Week 48, ETR + BR provided a statistically significant reduction in overall hospitalisation rates and German DRG calculated costs versus placebo + BR. Reductions in hospitalisation time indicate significant savings to the healthcare system and clinical benefit to the patients. As compared to the USA, the substantially lower reimbursements for long-term hospitalised patients by the terms of the German DRG system might indicate a significant funding gap for those hospitals treating patients in advanced stages of HIV disease.

#### Introduction

- The mean direct costs of HIV-related care per patient in the industrialised world are high in comparison to other chronic diseases
- Prior to the introduction of c-ART in the mid-1990s, costs were primarily driven by inpatient hospitalisations
- The use of c-ART has markedly reduced mortality and morbidity during the past decade, resulting in a reduction in inpatient utilisation
- Despite c-ART, hospitalisation remains a major issue for HIV-infected
- patients, especially those with advanced disease
- Hospitalisation expenses vary considerably from co



- placebo arms, respectively
- Reasons for admission, concomitant diseases, abnormal laboratory values and duration of stay were recorded for each hospitalised case
- The DUET study data provided information on patients' baseline characteristics and disease stage
- Duration of hospitalisation was calculated using the documented admission and discharge dates imputation methodology was used for missing dates (<1% of data)
- Hospitalisations were linked to confirmed or probable adjudicated AIDS-defining illness or death, which were reviewed by an independent adjudication panel

#### **Calculation of inpatient costs**

- Hospitalisation costs were calculated by applying the German DRG reimbursement system to each individual patient in the DUET trials according to this system, fixed-cost reimbursement is based on the
- specific diagnosis, procedures performed, any additional diagnoses and certain complicating aspects
- In ambiguous cases, the highest and lowest reimbursement was documented as hospitals would normally claim the higher reimbursement
- we calculated costs based on this scenario
- Based on legal regulation a fixed daily rate of €241 was calculated for all psychiatric admissions, as the German DRG reimbursement system is no foreseen to be applied to psychiatric admissions
- Mean daily hospitalisation costs were compared with those dete different reimbursement settings in the USA<sup>1-3</sup> and Germany (pre-DRG system)<sup>4</sup>







- When the lump sum-based German DRG reimbursement system was applied to the pooled 48-week DUET data, hospitalisation costs were substantially lower with ETR + BR than with placebo + BR
- The shorter mean duration of stay (11.0 vs 12.3 days) and associated increase in reimbursement in the ETR versus the placebo arm indicates reduced cost risks for hospital owners in Germany using ETR as part of a highly active ARV therapy (HAART) regimen in highly treatment-experienced patients
- Payers and decision makers should consider these results when approving ARV drugs for use in HAART and when calculating DRGs

## Implications of the study

- This 48-week analysis suggests there is both a clinical and cost benefit for the use of ETR as part of a HAART regimen in highly treatment-experienced patients
- This study suggests potential mean hospitalisation cost savings of more than €340,000 for patients in the ETR arm
- Hospitalisation cost-saving effects are sensitive to the specific healthcare system substantially higher cost savings (mean of €1.0–1.9 million) would be expected in healthcare systems (USA and Germany pre-DRG, respectively) that apply fixed daily rates of reimbursement
- HIV-related German DRGs (MDC 18A, n=249) were associated with longer mean duration of stay (13.2  $\pm$  16.1\* days) as compared with non-HIV-DRGs  $(8.9 \pm 9.5^* \text{ days}, n=129)$  and therefore with an elevated risk of underfunding for the hospital
- Future cost analyses are required to calculate the actual per patient saving; current data suggest decreases in hospitalisation rates observed when ETR is added to HAART may be associated with a decrease in cost of care \*Standard deviation

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dependent on the healthcare system

- costs are sensitive to structural changes in public healthcare systems e.g. the recent introduction of the lump sum-based DRG reimbursement system for inpatient treatment in Germany
- It is therefore important to investigate the impact of innovative ARV treatment strategies on hospitalisation costs in HIV-infected individuals

c-ART = combination ARV therapy: ARV = antiretrovira

#### **Background and aims**

- The prospective, randomised, double-blind, multicentre, Phase III DUET trials evaluated the efficacy and safety of the NNRTLETR versus placebo, both in combination with a BR in treatment-experienced patients with multiresistant HIV-1 infection
- This analysis assessed the effect of ETR + BR on hospitalisation rate, length, and costs in the German healthcare setting using pooled DUET 48-week data



2,000

1,500

#### Hospitalisation costs in the German DRG healthcare setting

Parameter	ETR arm (n=599)	Placebo arm (n=604)
No. of hospital stays DRGs within 'HIV-DRGs' (MDC 18A) DRGs with 'Non-HIV-DRGs' n, (%)	155 110 45 (29)	223 139 94 (42)
Cumulative time spent in hospital, days Mean duration of stay (range) Median	1,702 11.0 (1–71) 7	2,747 12.3 (1–140) 7
Cumulative cost of hospitalisation,* €	619,468-633,238	945,748-975,750
German DRG reimbursement per day,* €	364-372	344-355
German DRG reimbursement per stay, <sup>‡</sup> €	646-21,809	413-56,189

- The mean (range) cumulative cost of hospitalisation was €342,511.71 (€ 312,499.40– 356,281.77) lower in the ETR arm than in the placebo arm
- The excess expenditure in the placebo arm compared with the ETR arm was driven primarily by the higher number of hospital stays

1,702

p=0.0195

Argentina: HA Ariza, J Benetucci, P Cahn, LM Calanni, Ll Cassetti, J Corral, DO David, A Krolewiecki, MH Losso, P Patterson, RA Teijeiro; Brazil: CA da Cunha, B Grinsztejn, EG Kallas, JV Madruga, EM Netto, JH Pilotto, M Schechter, I Suleiman, A Timerman: Chile: I Ballesteros, R Northland: Costa Rica: AA Alvilés Montova, G Herrera Martinez, Solemani, A Infernan, Chie, J Baiestero, K Idoniano, Costa Arca, AcAvies Montoya, G Herta Martine A Solano Chinila, France: M Dupon, C Katama, JM Livozat, P Moriat, G Fialoux, C Piketty, J Poizot-Martin; Mexico: J Andrade-Villanueva, G Reyes-Terán, J Sierra-Madero; Panama: A Canton, A Rodriguez, N Sosa; Puerto Rico: JO Morales Ramirez, JL Santana Bagur, R Soto-Malave; **Thailand:** T Anekthananon, P Mootsikapun, K Ruxrungtham; **USA:** M Albrecht, N Bellos, R Bolan, P Brachman, C Brinson, F Cruickshank, R Elion, WJ Fessel, R Haubrich, T Hawkins, S Hodder, P Hutcherson, T Jefferson, H Katner, C Kinder, M Kozal, J Lalezari, J Leider, D McDonough, A Mills, K Mounzer, J Nadler, D Norris, W O'Brien, G Pierone, K Raben, B Rashbaum, M Rawlings, B Rodwick, P Ruane, J Sampson, S Schrader, A Scribner, M Sension, D Sweet, B Wade, D Wheeler, A Wilkin, T Wilkin, T Wills, M Wohlfeiler, K Workowski

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